Local Protection Project
Sebasticook River
Hartland, Maine

Operations and Maintenance Manual

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OPERATION AND MAINTENANCE MANUAL

FOR

FLOOD PROTECTION WORKS

ON

SEBASTICOOK RIVER

AT

HARTLAND, MAINE

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NEW ENGLAND DIVISION, CORPS OF ENGINEERS
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OPERATION AND MAINTENANCE
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FOREWORD

The successful functioning of the Hartland flood protective works is not assured solely by the construction of the system of dikes, floodwalls, and channel improvements. If the system is to perform the functions for which it was designed, it must be carefully maintained during periods of normal river stages and properly operated during flood periods.

The need for proper maintenance cannot be too highly stressed in view of the fact that large damages may be incurred through operating failure of a critical element in flood time, caused by deterioration or damage that would have been eliminated by proper maintenance.

Necessary maintenance and proper operation require that responsible local persons have a thorough understanding of the functions of the various units of the system and the recommended methods of maintaining the system and operating it during flood emergencies. It is the purpose of this manual to provide complete information so that all parties may fully understand their responsibilities in maintaining and operating the flood protection system in accordance with the regulations prescribed by the Secretary of the Army as amplified by this manual.

The general flood control Regulations for Maintenance and Operation of Flood Control Works quoted herein were approved by the Acting Secretary of War on 9 August 1944. Upon establishment of the Department of Defense, the improvement of rivers and harbors and other waterways for flood control and other purposes, formerly under the jurisdiction of the Secretary of War, became the responsibility of the Secretary of the Army. Reference therein to the Secretary of War and War Department shall be construed to mean, respectively, the Secretary of the Army and the Department of the Army. Where reference is made to the District Engineer in the Regulations included in this manual, it shall be construed to mean the Division Engineer, New England Division, Corps of Engineers.

OPERATION AND MAINTENANCE MANUAL

for

FLOOD PROTECTION WORKS

at

Hartland, Maine

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A. GENERAL

1. PURPOSE OF THIS MANUAL. The purpose of this Manual is to present detailed information to be used as a guide in complying with "Flood Control Regulations - Maintenance and Operation of Flood Control Works" as approved by the Acting Secretary of War on 9 August 1944, and published in this Manual as Appendix "A".

The regulations are intended to cover all local protection projects constructed by the Department of the Army throughout the United States, are general in nature, and obviously cannot give detailed instructions for the maintenance and operation of a specific project. The details set forth in this Manual for maintenance and operation of the Hartland project are intended to supplement the Regulations to insure the maximum protection against floods for which the project was designed. Failure to maintain and operate the project as required by the Regulations and as detailed herein can result in severe property losses, loss of life, and irreparable loss of confidence in the flood protection system by citizens who have invested their funds on the basis of the protection afforded by the flood control works.

Included in the authorization of the project are conditions specified by the Secretary of War to be met by local interests. One of these conditions is the Operation and Maintenance of the project after its completion. Under assurances, dated 16 January 1982 furnished to the Government by the Town of Hartland, the town has agreed to meet these conditions, and in particular, the operation and maintenance of the project after its completion. A copy of the above assurances is included in Appendix "D" of this Manual.

2. PROJECT AUTHORIZATION. The Hartland Local Protection Project plans and specifications were approved by the Chief of Engineers on 9 March 1982 under authority granted by Section 205 of the Flood Control Act of 1948, as amended by the Water Resources Development Act of 1974, Section 61(2), Public Law 93-251, 33 U.S.C.A. 701S, approved 7 March 1974.

3. PROJECT LOCATION. The Hartland local protection project is located generally along the left bank of the Sebasticook River in the town of Hartland, and extends from Great Moose Lake Dam to just downstream of the Irving Tanning Company.

4. DESCRIPTION OF PROJECT. Project features consist of some channel improvement upstream of the Main Street bridge, the construction of about 600 feet of earth dike at North Street, 650 feet of concrete floodwalls along the left bank of the river, bank protection and earth dikes along both banks of the river near the abutments of the former timber crib dam, interior drainage and other appurtenant works. In addition, approximately 2300 feet of 18-, 12- and 6-inch ductile iron pipe was installed from the Great Moose Lake Dam to the Irving Tanning Company to provide an adequate supply of process water to the Tanning Company.

5. EFFECTIVENESS OF PROTECTION. The protective works on the Sebasticook River was designed for a Standard Project Flood.

6. CONSTRUCTION HISTORY. The construction of the Hartland Local Protection Project was accomplished under one construction contract at a total cost of $1,304,000 to the Bridge Construction Corporation of Augusta, Maine. Notice to proceed with the work was given on 20 October 1982 and the project was placed in operation November 1983.

7. PLANS. Plans pertinent to the operation and maintenance of the project are included for reference in Appendix "F" in this volume. The original tracings, corrected to indicate "as-built" construction, have been forwarded to the town of Hartland.

8. LOCAL COOPERATION. The authorizing legislation for the Hartland project was Section 205 of the Flood Control Act of 1948, as amended. As part of this legislation, the assurances of local cooperation requires that operation and maintenance be provided. A copy of the formal assurances is contained in Appendix D of this Manual. This Manual is to assist the town of Hartland in fulfilling the responsibilities for maintaining and operating the Project.

9. GENERAL RULES AND REGULATIONS. Paragraph 208.10 (a) of the regulations prescribed by the Secretary of War gives general rules for the maintenance and operation of structures and facilities constructed by the United States for local protection. Applicable portions are quoted below to avoid the necessity for cross reference and are further defined by remarks under each quotation.

"(1) The structures and facilities constructed by the United States for local flood protection shall be continuously maintained in such a manner and operated at such times and for such periods as may be necessary to obtain the maximum benefits."

These requirements cannot be overstressed, and town authorities must make adequate provisions for funds, personnel, equipment, and materials to allow for the proper maintenance and operation of the flood protective works.

"(2) The State, political subdivision thereof, or other responsible local agency, which furnished assurance that it will maintain and operate flood control works in accordance with regulations prescribed by the Secretary of War, as required by law, shall appoint a permanent committee consisting of or headed by an official hereinafter called the "Superintendent", who shall be responsible for the development and maintenance of, and directly in charge of, an organization responsible for the efficient operation and maintenance of all of the structures and facilities during flood periods and for continuous inspection and maintenance of the project works during the periods of low water, all without cost to the United States."

The committe shall be composed of competent members, preferably persons experienced in engineering or construction work of a nature similar to the flood protection works. The committee must be given broad authority to carry out its responsibilities. The name, address, and office and home telephone numbers of the Superintendent, and any changes thereof, shall be promptly furnished the Division Engineer.

"(3) No encroachment or trespass which will adversely affect the efficient operation or maintenance of the project works shall be permitted upon the rights-of-way for the protective facilities."

The disposal of rubbish, erection of fences, or barriers, the painting or erection of signs, the attachment of clothes lines to flood walls, or any form of trespassing on the project shall be prohibited.

"(4) No improvement shall be passed over, under, or through the walls, dikes, improved channels or floodways, nor shall any excavation or construction be permitted within the limits of the project right-ofway, nor shall any change be made in any feature of the works without prior determination by the District Engineer or his authorized representatives that such improvement, excavation, construction, or alteration will not adversely affect the functioning of the protective facilities. Such improvements or alterations as may be found to be desirable and permissible under the above determination shall be constructed in accordance with standard engineering practice. Advice regarding the effect of proposed improvements or alterations on the functioning of the project and information concerning methods of construction acceptable under standard engineering practice shall be obtained from the District Engineer or, if otherwise obtained, shall be submitted for his approval. Drawings or prints showing such improvements or alterations as finally constructed shall be furnished the District Engineer after completion of the work."

Any contemplated improvements or alterations as outlined above must be submitted to the Corps of Engineers, Waltham, Massachusetts, and the approval of the Division Engineer obtained prior to the town authorizing the work. All requests for approval shall be in writing and complete drawings in duplicate, one set of which shall be in reproducible form, must be submitted along with a full description of the work intended. The town will be held responsible for obtaining prior approval from the Corps of Engineers for any improvements or alterations proposed by itself, private parties or any public parties. The town shall furnish the Division Engineer as-built drawings, in sextuplicate, of the completed work.

"(6) It shall be the duty of the Superintendent to submit a semiannual report to the District Engineer covering inspection, maintenance, and operation of the protective works."

See Paragraph 12 of this Manual for instructions on submitting reports.

"(7) The District Engineer or his authorized representatives shall have access at all times to all portions of the protective works."

The Division Engineer or his representatives will make periodic inspections of the protective works to determine if the project is being properly maintained and operated by the town. "Follow-up" inspections, when necessary, will be made to determine if deficiencies observed during the inspection have been corrected. A report with the results of each inspection will be furnished to the town of Hartland for appropriate action.

"(8) Maintenance measures or repairs which the District Engineer deems necessary shall be promptly accomplished."

The town should maintain the facilities and keep them in good repair and not wait for the Division Engineer to call such matters to its attention. Upon request, the Division Office will advise the town how to make any major repairs to the facilities.

"(9) Appropriate measures shall be taken by local authorities to insure that the activities of all local organizations operating public or private facilities connected with the protective works are coordinated with those of the Superintendent's organization during flood periods."

The town should formulate plans and negotiate agreements with local organizations and companies, who are operating facilities connected with the protective works, to insure that their activities will be properly coordinated with the Superintendent's organization during flood periods.

"(10) The War Department will furnish local interests with an Operation and Maintenance Manual for each completed project to assist them in carrying out their obligations under these regulations."

The flood control committee should familiarize itself with the contents of this manual. The town authorities are encouraged to call on the Division Office of the Corps of Engineers for any additional advice or instructions required by them in carrying out the town's obligations for maintaining and operating the flood protection facilities.

10. MAINTENANCE.

a. The word "maintenance" as used in this manual applies to the upkeep, repair and care of the work constructed by the Government and turned over to the town of Hartland. If the work is neglected there will be deterioration and possible failure during a potential flood when there is need of dependable protection.

b. Satisfactory and dependable operation depends on constant maintenance. The organization that performs maintenance must be familiar with various parts of the system and will be in a position to use them effectively in time of need.

c. Maintenance includes regular inspection of the entire system. The purpose of an inspection is to detect any deterioration or faulty operation that indicates a need for repair or replacement. Inspection should be accomplished by persons walking from one extreme of the system to the other and visually inspecting each feature at close quarters.

d. In addition to inspection, gate valves and portable pumps, require testing at stated intervals to insure proper operation of all components.

e. During the winter months it may be necessary to inspect certain project features in order to insure that no problems exist that could delay the operation of the project in the event a sudden thaw and rain storm occurs. The Superintendent should prepare a check off list of potential problems. This list should provide that:

(1) Conduit and drainage structures, entrances and openings are free of debris, leaves, snow and ice.
(2) Gate valve controls are accessible.
(3) Stop log structure is free of ice and debris.
(4) Portable pumps are accessible and operable.

This list should be expanded as experience indicates.

f. Each of the major features of the project is discussed separately. Particular emphasis is placed on those points which, based on experience with special project features, require special attention.

11. OPERATION.

a. Operation in this manual refers to the actual use of the various features of the protection works during flood periods. It is intended that the procedure outlines herein under Appendix "B" will be sufficient to insure protection from floods to the design stage. However, advice relative to operation may be obtained, during working hours, from the Reservoir Control Center (Telephone 617-647-8627) of the New England Division Office.

b. Representatives of the Division Engineer stand ready to assist the town of Hartland in the operation of the project. This in no way lessens the responsibility of the town of Hartland in operating the project.

c. When high river flows and stages are expected it is important that the Superintendent make immediate decisions, take prompt action and have the authority to carry out his decisions.

d. To insure correct operation it is essential that at least two persons (preferably 3): (1) Be familiar with all phases of the flood protection works; (2) Know where to locate and when to start the portable pumps; (3) Know the location of all valves as well as stop log structures, and when to close them; (4) Know just what supplies and transport are on hand; (5) Know what men and tools can be mobilized for the patrolling and repair work.

e. Arrangements should be made with the National Weather Service in Portland, Maine to keep the town informed on storm warnings.

12. INSPECTION AND REPORTS. The regulations prescribed by the Secretary of the Army call for semi-annual reports to be submitted by the Superintendent to the Division Engineer covering inspection and maintenance. Inspection of the flood protective facilities shall be made immediately prior to flood seasons, immediately following floods, and otherwise at intervals not exceeding 90 days as required by the regulations.

To assist the Superintendent in making his inspections and reports, sample check list forms including blank NED Form 513 have been prepared and included in Appendix "C". The Superintendent shall have additional copies printed for use in submitting his reports.

The semi-annual reports shall be submitted in triplicate to the Division Engineer, Attention: Project Operations Branch, Operations Division, each February and August. The reports will be submitted in letter form with copies of the inspection forms covering the inspections made during the period of the report. The reports shall cover the following points:

a. A description of the maintenance work performed in the preceding six months.

b. The number and classification of men working on maintenance, regularly and intermittently.

c. Description of any work performed by contract on the repair or improvement of the project.

d. Description of use or operation of the system during the period being reported.

e. Suggestions relative to public cooperation and comments concerning public sentiment on the protection obtained are considered pertinent and desirable but the inclusion of such data is not required.

In addition to the maintenance reports discussed above, monthly reports of operations will be submitted to the Division Engineer. The purpose of the monthly reports is to maintain an up-to-date record of project operations, so that prescribed regulation procedures may be analyzed and modified, where necessary, as actual regulation experience indicates. These reports should include gage readings, gate settings, pumping data and other pertinent information.

B. CHANNEL IMPROVEMENT

13. DESCRIPTION. The channel improvement covers the removal of the existing crib dam upstream of the Main Street Bridge and the removal of the sediment in the river bottom. Several sections of the banks along both sides of the river have been covered with a layer of stone protection.

14. MAINTENANCE. Paragraph 208.10(g)(1) of the prescribed regulations sets forth rules for the maintenance of channels and floodways. These rules are quoted below, followed by brief comments on the particular applicability of these rules to the Hartland project.

a. Channels and Floodways - (1) Maintenance - Periodic inspections of improved channels and floodways shall be made by the Superintendent to be certain that:

"(i) The channel or floodway is clear of debris, weeds, and wild growth."

All debris and growth which tend to restrict the channel shall be removed promptly.

"(ii) The channel or floodway is not being restricted by the depositing of waste materials, building of unauthorized structures or other encroachments."

Dumping of waste materials or any types of encroachment of the channel shall be prohibited and prompt steps shall be taken to remove or have removed any such encroachments.

"(iii) The capacity of the channel or floodway is not being reduced by the formation of shoals.

"Shoal areas should be removed but care should be exercised that slopes of the channel and existing banks are not undercut. Existence of shoal areas will be apparent from inspections during time of low flow.

"(iv) Banks are not being damaged by rain or wave wash, and that no sloughing of banks has occurred."

Banks damaged by rain or wave wash or sloughing shall be repaired promptly, using bankrun gravel and stone similar to that used in their original construction.

"(v) Riprap sections and deflection dikes and walls are in good condition."

Stone slope protection must be maintained in good condition to resist erosion. Any loss of stone due to slides, erosion or vandalism must be promptly replaced. Periodic checks should be made of the stone slope protection for possible movement or loss of stone, and prompt corrective action taken. The stone toes should be observed closely for stability.

Such inspection shall be made prior to the beginning of the flood season and otherwise at intervals not to exceed 90 days. Immediate steps will be taken to remedy any adverse conditions disclosed by such inspections. Measures will be taken by the Superintendent to promote the growth of grass on bank slopes and earth dikes. The Superintendent shall provide for periodic repair and cleaning of debris basins, check dams, and related structures as may be necessary.

15. OPERATION. Paragraph 208.10(g)(2) of the prescribed regulations gives rules for operation of channels and floodways. These rules which are quoted below are self-explanatory and require no amplification with regard to the Hartland project.

"(2) Operation. Both banks of the channel shall be patrolled during periods of high water, and measures shall be taken to protect those reaches being attacked by the current or by wave wash. Appropriate measures shall be taken to prevent the formation of jams of ice or debris. Large objects which become lodged against the bank shall be removed. The improved channel or floodway shall be thoroughly inspected immediately following each major high water period. As soon as practicable thereafter, all snags and other debris shall be removed and all damage to banks, riprap, deflection dikes and walls, drainage outlets, or other flood control structures repaired."

Rules and instructions for emergency repair measures for the dikes as given in Paragraph 19 are equally applicable to emergency repairs of the channel.

C. DIKES

16. DESCRIPTION. There is a dike along the left bank of the Sebasticook River upstream of the Main Street Bridge and a revetment along the right bank. The dike and revetment are rolled earth filled, with stone slope protection along river sides, with topsoiled and seeded tops and land slopes The land side slopes and the river side slopes are 1 on 2.0. A rolled earthfill dike with topsoiled and seeded side slopes and top was constructed at North Street. Side slopes are 1 on 2.0. An ungated conduit was installed in the dike to permit unregulated flow through the dike.

17. MAINTENANCE. Paragraph 208.10(b)(1) of prescribed regulations sets forth rules for the maintenance of levees. For the purpose of this manual the words "levees" and dikes" are interchangeable. These rules quoted for levees apply equally to earth dikes and the revetment, and applicable portions are quoted below. Following this, points that apply particularly to the Hartland project are discussed.

"Dikes. (1) Maintenance. The Superintendent shall provide at all times such maintenance as may be required to insure serviceability of the structures in time of flood. Measures shall be taken to promote the growth of sod, to exterminate burrowing animals, and to provide for routine mowing of the grass and weeds, removal of wild growth and drift deposits, and repair of damage caused by erosion or other forces."

"To prevent development of possible piping channels and discontinuities which may lead to erosion of embankments by flowing water, trees or shrubs will not be planted on the sides or top of embankments or within 15 feet of the toe of the structure. This will preclude possible structural damage and will insure continuous access for maintenance purposes. "Periodic inspections shall be made by the Superintendent to insure that the above maintenance measures are being effectively carried out and, further to be certain that:"

"(i) No unusual settlement, sloughing or material loss of grade or levee cross section has taken place;

"(ii) No caving has occurred on either the land side or the river side of the levee which might affect the stability of the levee section;

"(iii) No seepage, saturated areas, or sand boils are occuring;

(iv) Deleted.

"(v) Drains through the levees ..... are in good working condition;

"(vi) No revetment work or riprap has been displaced, washed out or removed;

"(vii) No action is being taken, such as burning grass and weeds during inappropriate seasons, which will retard or destroy the growth of sod;

(viii) N/A

"(ix) Crown of levee is shaped so as to drain readily, and roadway thereon, if any, is well shaped and maintained;

"(x) There is no unauthorized . . . vehicular traffic on the levees;

"(xi) Encroachments are not being made on the levee right-of-way which might endanger the structure or hinder its proper and efficient functioning during time of emergency."

"Such inspections shall be made immediately prior to the beginning of the flood season; immediately following each major high water period, and otherwise at intervals not exceeding 90 days; and such intermediate times as may be necessary to insure the best possible care of the levee. Immediate steps will be taken to correct dangerous conditions disclosed by such inspections. Regular maintenance repair measures shall be accomplished during the appropriate season as scheduled by the Superintendent."

Any unusual settlement, sloughing or caving should be corrected to restore the original dike grades. No major repair work shall be made without prior approval of the Division Engineer, in order that such repairs that may be necessary will not adversely affect the functioning of the protective facilities.

Where so indicated riverside and/or landside the slopes of dikes and the tops of the dikes were topsoiled and seeded to minimize the damage from erosion and scour caused by surface runoff. Maintenance of a sturdy sod growth on dike embankments is highly important as sod is one of the most effective means of protecting the dike against erosion from rain, current and wavewash. Periodic mowing is essential to maintaining a good sod growth, and should be done at such intervals as necessary to keep down weeds and other noxious growth and to prevent the grass height from exceeding 12".

When sections of the dikes require reestablishment of turf, seeding operations should be started at the earliest practical date in the spring to secure the greatest possible protection against erosion. Areas requiring seeding shall be dressed to fill gullies and irregularities in the surface. The following seed mixture was used in the original construction:

TABLE I

GRASS SEED

Percent by Weight

Kind of Seed	Min. % In Mixture	Min. % Purity	Min % Germination
Red Fescue	30	87	80
Kentucky Bluegrass	30	97	80
Chewings Fescue	30	85	80
Perenial Rye	10	98	90

Note: Weed seed shall not exceed 1.0% of total mixture by weight.

Inspections of the dikes shall be made during and after periods of high water, as it is at such times that any weak spots will be discovered that might otherwise be overlooked.

All stone protection shall be kept free of vegetation growth.

18. OPERATION. Paragraph 208.10(b)(2) of the prescribed regulations sets forth rules for the operation of levees. These rules apply equally to earth dikes and are quoted below. Following these, a few of the points which apply particularly to the Hartland project will be discussed.

"(2) Operation. During flood periods the levee shall be patrolled continuously to locate possible sand boils or unusual wetness of the landward slope and to be certain that:

"(i) There are no indications of slides or sloughs developing;

"(ii) Wave wash or scouring action is not occurring;

"(iii) No low reaches of levee exist which may be overtopped;

"(iv) No other conditions exist which might endanger the structure."

"Appropriate advance measures will be taken to insure the availability of adequate labor and materials to meet all contingencies. Immediate steps will be taken to control any condition which endangers the levee and to repair the damaged section."

Operation of the dikes may be at a time of moderately high water, such as a spring freshet, or may be when unusual conditions indicate the possibility of dangerous flood heights. Prompt action in starting work is of the utmost importance.

Requirements for patrolling the dikes depend on the depth of water on the river side of dike. Patrolling of the dikes should start when the water surfaces of the river and/or brook reaches the same elevation as the surface of the ground on the land side of the dikes and floodwalls. The patrolling should continue until the flood has reached its peak and receded below the elevation of the land side ground.

Patrolmen should be thoroughly instructed as to their duties, what they are to watch for, and the exact limits of their inspection area. On each journey of inspection they should carefully examine both slopes of the dikes for seepage or wetness on landside slope, sand boils on landside of dike, wave wash or scouring on riverside slope, and indications of slides or sloughs on either slope.

All unauthorized traffic on the dikes should be stopped at once, and patrolmen should be instructed to keep people off the dike unless they can show passes or credentials authorizing their presence.

19. EMERGENCY REPAIR MEASURES. Scours. Careful watch should be maintained of the dike for indication of scouring. If any indication of scouring is observed, soundings should be taken to observe the amount and progress of the scour. Sandbagging or dumped rock will generally afford the most practicable means of combating this condition. The open ends of sandbags so used must be sewed or tied after filling.

Wave wash. Wave action may cause displacement of stone protection and wash-out of earth materials on the riverside slopes of the dikes. Well-sodded slopes will usually withstand waves from a storm of about an hour's duration without serious damage. An attack over a longer period may become serious and the slopes should be protected by sacking or equivalent means. The extent of washes can be determined by wading along the attached slope. Sandbags should be placed in the erosions in as effective a manner as possible, carrying the protection well above the action of waves. Sandbags used for this purpose require only about one-half cubic foot of material and should be sewed or tied. The aim is to obtain a maximum of coverage with only sufficient weight to hold the sack in place.

Sand Boils. a. General. A sand boil is the result of a transfer of pressure head and seepage from the river, through a pervious stratum near or at the surface, to the landside of the dike.

This seepage under pressure tends to push its way to the surface and actually floats the material through which it flows. No harmful effect results provided the weight of the relatively impervious soil layer

overlying the pervious stratum, in which the flow under pressure is occurring, is sufficient to counterbalance this pressure. When the soil stratum overlying the pervious layer is insufficient to counterbalance the upward pressure or when no such stratum exists, boils break through the surface on the landside wherever these weaknesses are present. The sand boil may discharge relatively clear water or the discharge may contain quantities of sand and silt, depending upon the magnitude of the pressure and the size of the boil.

b. Effects of sand boils. Sand boils can produce three distinctly different effects on the levee, depending upon the condition of flow under the levee. These three effects are illustrated in Appendix "E". In Figure 1, Plate No. I, the seepage flow develops a definite pipe or tube under the levee. This breaks out at the landside toe in the form of one or more large sand boils. Unless checked, this flow causes a cavern to be developed under the levee, resulting in subsidence of the levee and subsequent overtopping. This case can be most easily recognized by slumping of the levee crown. Figure 2, Plate No. I of Appendix "E", illustrates the case where seepage flows under pressure under the levee without following a defined path, as the case above. This flow results in one or more boils outcropping at or near the landside toe. The flow from these boils tends to undercut and ravel the slope, resulting in a sloughing of the slope. Evidence of this type of failure is found in undercutting and ravelling at the landside toe. Figure 3, Plate No. I, of Appendix "E", shows a third type of effect of a sand boil. In this case, numerous small boils, many of which are scarcely noticeable, outcrop at or near the toe. While no boil may appear to be dangerous in itself, the consequence of the group of boils is to cause flotation of the soil, thereby reducing the shearing strength of the material at the toe, where maximum shearing stress occurs, to such an extent that failure of the slope through sliding results.

c. General instructions for handling sand boils. All sand boils shall be watched closely. A sand boil which discharges clear water in a steady flow is usually not dangerous to the safety of the dike. However, if the flow of water increases and the sand boil begins to discharge material, corrective action shall be taken immediately.

d. Method of treatment.

(1) The accepted method of treating sand boils is to construct a ring of sandbags around the boil, building up a head of water within the ring sufficient to prevent further movement of sand and silt. The accepted method of ringing a sand boil, shown on Plate No. II of Appendix "E" is as follows:

(a) The entire base of the sack ring is cleared of debris in order to provide a watertight bond between the natural ground and the sack ring.

(b) The sacks are then laid in a ring around the boil, with joints staggered, and with loose earth between all sacks.

(c) .The ring is carried only to a height sufficient to prevent material from being discharged. The ring should not entirely stop the flow of water, because of the probability of the excessive local pressure head causing additional ruptures of impervious strata and boils nearby.

(d) A "V" shaped drain constructed of two boards, or a piece of sheet metal, is then placed near the top of the ring to carry off water.

(2) Actual conditions at each sand boil will determine the exact dimensions of the ring. The diameter and height of the ring depends upon the size of the boil, and the flow of water from it. In general, the following considerations should govern:

(a) The base width should be no less than 1-1/2 times the contemplated height.

(b) It is well to include weak ground near the boil within the ring, thereby preventing a break-through later.

(c) The ring should be of sufficient size to permit sacking operations to keep ahead of the flow of water.

(3) Where many boils are found to exist in a given area, a ring levee of sandbags shall be constructed around the entire area and, if necessary, water pumped into the area to provide sufficient weight to counterbalance the upward pressure.

Sloughs. During prolonged high water stages, sloughing conditions on the landside slopes may occur. Such operations should be observed closely as to the progress of seepage up the landslide slope and the amount of material that is being carried by seepage. If the seep velocity becomes great enough to cause, or probably cause, erosion or sloughing of the slope, a sandbag covering should be placed on the seeping area, beginning well out from the toe and progressing up the slope. The covering should extend several feet beyond the saturated area. If the material is obtainable, the affected area should be covered with brush, straw or similar permeable material to a depth of two to four inches before placing the sandbag cover. This will permit the seep water to get away while serving as a filter to prevent loss of earth from the dike. After the covering is placed, close observation should be maintained snd additional layers of sandbags placed on the previous one until the velocity of the seepage is reduced to a point at which the amount of material carried is negligible. Sacking sloughs are illustrated on Plate No. III of Appendix "E".

Raising existing earth dikes. In an emergency, time and other conditions permitting, the grade of a dike can be safely raised three feet. The methods most commonly used for this purpose are outlined in the following paragraphs.

a. Sandbag topping. The sack ordinarily used for topping an earth dike shall be a grain or feed type sack (in lieu of canvas or sisal-craft type) which holds 100 pounds of grain. Smaller sacks may be used if feed sacks are not available. Grain sacks, filled with about one cubic foot of earth, weighing about 100 pounds, will provide a unit about six inches high, one foot wide and two feet in length.

The sacks may be filled at the source of material and hauled to the dike or filled from stockpile or borrow areas at the dike, conditions determining the method employed. The same is true of filling; i.e., whether power or hand methods are used.

The open end of the sack should always face upstream or toward the riverside of the dike and need not be sewed or tied. When the sack faces the river the loose end should be folded under and when facing upstream the loose end covered by the succeeding sack.

The front line of sandbags in the first layer should be laid parallel to the dike center line and remaining bags at right angles to the center line. The sandbags in the second layer are all laid at right angles to the center line, the third row similar to the first, etc., as shown on Plate No. IV of Appendix "E". All sacks should be lapped about 1/3 each way and well mauled or tramped into place. The sacks should be filled to two-thirds their capacity when flattened out to facilitate proper placing and prevent bursting the sack when mauled or tramped into place.

Plate No. IV of Appendix "E" illustrates the progressive method of increasing the dike height and gives an approximation of the number of sacks required for dikes of various heights. Plate No. V of Appendix "E" shows pictures of model sack dike or topping.

A crew of 160 men should fill, carry and place approximately 5,000 sacks per eight-hour day, all hand labor, when the source of material is within 150 feet of the point of placement. Production will depend on conditions at the site, location of storage and loading areas, and type of bag filling equipment used.

b. Lumber and sandbag topping is the most satisfactory method of raising low reaches of earth dike in emergencies. The chief objection is the time required to install. In putting on this topping, as well as any other topping, a careful line of levels should be run and grade stakes set in advance unless the dike top follows a dependable grade line. Two-by-four or two-by-six inch stakes should then be driven on the river side of the crown six feet apart and one-by-twelve inch boards nailed to land side of the stakes. This wall, backed with a single tier of sandbags, willhold

out at least one foot of water. If the second foot is necessary, the layers of bags will have to be increased in number and reinforced. Sandbags are laid substantially in the manner described in a above. The stakes should be driven at least three feet into the ground, leaving at least three feet out, which will, in extreme cases, hold a three-foot topping if properly braced behind the sandbags. Plate No. VI of Appendix "E" illustrates this method of raising a dike.

D. FLOODWALLS

20. DESCRIPTION. The floodwalls are Type "L" and "T" of reinforced concrete construction with waterstops at all joints. Only the upper parts of the walls are visible since the fill and drainage materials placed on both sides of the wall have been backfilled and compacted. In most instances, the channel side slopes and the stone protection abut the river side of the wall.

21. MAINTENANCE. Paragraph 208.10(c)(1) of the prescribed regulations sets forth rules for the maintenance of floodwalls. Applicable portions of these rules are quoted below.

"Periodic inspections shall be made by the Superintendent to be certain that:

"(i) No seepage, saturated areas, or sand boils are occurring;

"(ii) No undue settlement has occurred which affects the stability of the wall or its water tightness;

"(iii) No trees exist, the roots of which might extend under the wall and offer accelerated seepage paths;

"(iv) The concrete has not undergone cracking, chipping, or breaking to an extent which might affect the stability of the wall or its water tightness;

"(v) There are no encroachments upon the right-of-way which might endanger the structure or hinder its functioning in time of flood;

"(vi) Care is being exercised to prevent accumulation of trash and debris adjacent to walls, and to insure that no fires are being built near them;

"(vii) No bank caving conditions exist riverward of the wall which might endanger its stability;

"(viii) N/A

Such inspections shall be made immediately prior to the beginning of the flood season, immediately following each major high water period, and otherwise at intervals not exceeding 90 days. Measures to eliminate encroachments and effect repairs found necessary by such inspections shall be undertaken immediately. All repairs shall be accomplished by methods acceptable in standard engineering practice.

22. OPERATION. Paragraph 208.10(c)(2) of the prescribed regulations gives rules pertaining to floodwalls during periods of flood emergency.

"Continuous patrol of the wall shall be maintained during flood periods to locate possible leakage at monolith joints or seepage underneath the wall. Floating plant or boats will not be allowed to lie against or tie up to the wall. Should it become necessary during a flood emergency to pass anchor cables over the wall, adequate measures shall be taken to protect the concrete and construction joints. Immediate steps shall be taken to correct any condition which endangers the stability of the wall."

23. EMERGENCY REPAIR MEASURES. The Superintendent or responsible members of his organization shall take immediate action to correct any condition which endangers the stability of the wall. All such measures taken will be reported to the Division Engineer immediately after the flood period.

Sand Boils. See Paragraph 19 for emergency measures to be taken in the event sand boils develop.

Monolith Joints. Appreciable leakage through vertical monolith joints can be controlled by dumping cinders, sawdust, or similar material on the riverside of the wall. The dumped material will be carried into the joint by the water and plug the leak.

Raising Grade of Wall. In an emergency, the walls may be raised temporarily by a single row of sandbags or by erecting wooden flashboards as shown in Plate VII of Appendix "E".

E. WATER SUPPLY AND DRAINAGE STRUCTURES

24. DESCRIPTION. Storm drains that pass under the protection are shown on general plan and utility sheets included in Appendix "F" of this Manual. See drawings for location of the process water intake structure and storm drain intake structure. The storm drain line passing through the protection near wall station 7+00 includes an 18-inch gate valve on the landside of the wall and an 18-inch flap valve on the riverside.

a. Construction. The intake structures are of concrete construction of various sizes and configurations with access through top of structure. See drawings for various types of construction covering other type drainage structures.

25. MAINTENANCE. The lines and drains passing through the protection should be adequately maintained and any breaks or leaks promptly repaired. Where any excavations are necessary, backfills shall be carefully and thoroughly compacted, taking care that no voids or nests of cobbles or gravel are allowed to occur. Paragraph 208.10 (d)(1) of the prescribed regulations gives rules for the maintenance of drainage structures.

"Adequate measures shall be taken to insure that inlet and outlet channels are kept open and that trash, driftwood, or debris is not allowed to accumulate near drainage structures. Gates at drainage structures shall be examined and trial operated at least once every 90 days. Periodic inspections shall be made by the Superintendent to be certain that:

"(i) Pipes, gates, operating mechanism, riprap, and headwalls are in good condition;

"(ii) Inlet and outlet channels are open;

"(iii) Care is being exercised to prevent the accumulation of trash and debris near the structures and that no fires are being built near bituminous coated pipes;

"(iv) Erosion is not occuring adjacent to the structure which might endanger its water tightness or stability.

"Immediate steps will be taken to repair damage, replace missing or broken parts, or remedy adverse conditions disclosed by such inspections."

Location where storm drain effluents are discharged should be examined periodically to insure that there is no problem occuring.

All drainage structures including standard manholes shall be inspected at least once a year and all collected debris shall be removed.

Flap gate shall be inspected to make sure no debris is building up behind valve which would prevent it from closing properly during flood periods.

All metal surfaces not otherwise protected must be kept painted to maintain the metal in good condition. The exterior and interior metal work, such as ladders, pipe railings, cover plates and flap valves, will require frequent painting because of exposure to the weather and/or to waters.

All joints and fittings will be greased as needed to insure continuous operation of the flap valve and gate valve.

F. PORTABLE PUMPS

26. PUMPS. Two portable diesel engine driven, water-cooled, self-priming centrifugal pumps have been furnished. Each pump has a capacity of 1200 GPM at a static suction head of 10 feet; and a total operating head of 30 feet. Each pump has an electric starter and 60 feet of 6" hose in 10 foot lengths. The pumps and diesel engines are mounted on formed steel bases with lifting balls and pneumatic tires and are of the type that can be towed by a truck or tractor.

The batteries for starting the pump engine will be fully charged at all times.

The maintenance and operator's manuals for the diesel engines are furnished with the engine and stored with the pump units. The pumps will be stored in the town of Hartland.

G. WATER SUPPLY LINE

27. DESCRIPTION. Approximately 2300 feet of process water supply pipe was installed from a new intake structure in the Great Moose Lake above the Dam to the Irving Tanning Company. The pipe consists primarily of 18-inch diameter ductile iron with connections of 6-inch ductile iron to fire hydrants and 10-and 12-inch ductile iron to the tannery water system. Location of the piping is shown on the drawings in Appendix F. An 18-inch gate valve has been installed at the inlet in Great Moose Lake and a 12-inch and 10-inch gate valve was installed where these lines branch from the 18-inch line. A 6-inch gate valve was installed in the line leading to each of the fire hydrants.

H. MISCELLANEOUS FACILITIES

28. DESCRIPTION. Miscellaneous structures and facilities constructed as part of the protective works include pavements, chain link fencing, and railings.

29. MAINTENANCE.

a. Paragraph 208.10(h)(1) of the prescribed regulations governs the maintenance of miscellaneous facilities:

"Miscellaneous structures and facilities constructed as a part of the protective works and other structures and facilities which function as a part of, or affect the efficient functioning of the protective works, shall be periodically inspected by the Superintendent and appropriate maintenance measures taken. Damaged or unservicable parts shall be repaired or replaced without delay."

30. OPERATION.

a. Regulations. Paragraph 208.10(h)(2) of the prescribed regulations governs the operation of miscellaneous facilities.

"Miscellaneous facilities shall be operated to prevent or reduce flooding during periods of high water. Those facilities constructed as a part of the protective works shall not be used for purposes other than flood protection without approval of the Division Engineer unless designed therefor."

b. Debris Removal. During a flood or heavy rainfall, observations for collection of debris should be made along the dike stone protection. Debris could block the flow of water to the drain inlets. Men and equipment should be available within reasonable time and distance to assist in debris removal wherever necessary.

I. OPERATIONS PLAN

31. PROJECT OPERATION. A plan of operation for floods is covered in Appendix "B". Severe floods can occur at any time of year. Fortunately, a few hours warning time should be available for local authorities to mobilize men and equipment for serious flood conditions. Manpower and equipment should be on call for duty on the various project features to insure maximum project operation and efficiency.

32. COOPERATION. Representatives of the Division Engineer stand ready to assist the town in the operation of the project. This in no way lessens the responsibility of the town of Hartland in the operation of the project.

J. DRAWINGS AND SPECIFICATIONS

33. DRAWINGS AND SPECIFICATIONS. A complete set of contract drawings and specifications was furnished the town of Hartland at the time of initiation of project construction. A full size set of drawings showing the project as actually constructed was furnished the town of Hartland at the time of completion and transmittal of this manual; reduced prints of these drawings pertinent to the operation and maintenance of the project are included for reference in Appendix "F".

34. OPERATION AND MAINTENANCE MANUALS. Below is a list of Operation and Maintenance manuals for various pieces of Mechanical Equipment which were furnished the town of Hartland. These manuals should be used to supplement this O&M manual in the operation and maintenance of the project.

a. White Engines Inc. - Diesel Engine O&M manual.

b. Operating and Service Instructions for Self Priming 6-inch Midland Portable Pumps.

APPENDIX A

REGULATIONS PRESCRIBED BY THE

SECRETARY OF WAR

TITLE 33—NAVIGATION AND NAVIGABLE WATERS

Chapter II—Corps of Engineers, War Department

PART 208—FLOOD CONTROL REGULATIONS

MAINTENANCE AND OPERATION OF FLOOD CONTROL WORKS

Pursuant to the provisions of section 3 of the Act of Congress approved June 22, 1936, as amended and supplemented (49 Stat. 1571; 50 Stat. 877; and 55 Stat. 638; 33 U. S. C. 701c; 701c-1), the following regulations are hereby prescribed to govern the maintenance and operation of flood control works:

§ 208.10 *Local flood protection works; maintenance and operation of structures and facilities.*—(a) *General.* (1) The structures and facilities constructed by the United States for local flood protection shall be continuously maintained in such a manner and operated at such times and for such periods as may be necessary to obtain the maximum benefits.

(2) The State, political subdivision thereof, or other responsible local agency, which furnished assurance that it will maintain and operate flood control works in accordance with regulations prescribed by the Secretary of War, as required by law, shall appoint a permanent committee consisting of or headed by an official hereinafter called the "Superintendent," who shall be responsible for the development and maintenance of, and directly in charge of, an organization responsible for the efficient operation and maintenance of all of the structures and facilities during flood periods and for continuous inspection and maintenance of the project works during periods of low water, all without cost to the United States.

(3) A reserve supply of materials needed during a flood emergency shall be kept on hand at all times.

(4) No encroachment or trespass which will adversely affect the efficient operation or maintenance of the project works shall be permitted upon the rights-of-way for the protective facilities.

(5) No improvement shall be passed over, under, or through the walls, levees, improved channels or floodways, nor shall any excavation or construction be permitted within the limits of the project right-of-way, nor shall any change be made in any feature of the works without prior determination by the District Engineer of the War Department or his authorized representative that such improvement, excavation, construction, or alteration will not adversely affect the functioning of the protective facilities. Such improvements or alterations as may be found to be desirable and permissible under the above determination shall be constructed in accordance with standard engineering practice. Advice regarding the effect of proposed improvements or alterations on the functioning of the project and information concerning methods of construction acceptable under standard engineering practice shall be obtained from the District Engineer or, if otherwise obtained, shall be submitted for his approval. Drawings or prints showing such improvements or alterations as finally constructed shall be furnished the District Engineer after completion of the work.

(6) It shall be the duty of the superintendent to submit a semiannual report to the District Engineer covering inspection, maintenance, and operation of the protective works.

(7) The District Engineer or his authorized representatives shall have access at all times to all portions of the protective works.

(8) Maintenance measures or repairs which the District Engineer deems necessary shall be promptly taken or made.

(9) Appropriate measures shall be taken by local authorities to insure that the activities of all local organizations operating public or private facilities connected with the protective works are coordinated with those of the Superintendent's organization during flood periods.

(10) The War Department will furnish local interests with an Operation and Maintenance Manual for each completed project, or separate useful part thereof, to assist them in carrying out their obligations under these regulations.

(b) *Levees.*—(1) *Maintenance.* The Superintendent shall provide at all times such maintenance as may be required to insure serviceability of the structures in time of flood. Measures shall be taken to promote the growth of sod, exterminate burrowing animals, and to provide for routine mowing of the grass and weeds, removal of wild growth and drift deposits, and repair of damage caused by erosion or other forces. Where practicable, measures shall be taken to retard bank erosion by planting of willows or other suitable growth on areas riverward of the levees. Periodic inspections shall be made by the Superintendent to insure that the above maintenance measures are being effectively carried out and, further, to be certain that:

(i) No unusual settlement, sloughing, or material loss of grade or levee cross section has taken place;

(ii) No caving has occurred on either the land side or the river side of the levee which might affect the stability of the levee section;

(iii) No seepage, saturated areas, or sand boils are occurring;

(iv) Toe drainage systems and pressure relief wells are in good working condition, and that such facilities are not becoming clogged;

(v) Drains through the levees and gates on said drains are in good working condition;

(vi) No revetment work or riprap has been displaced, washed out, or removed;

(vii) No action is being taken, such as burning grass and weeds during inappropriate seasons, which will retard or destroy the growth of sod;

(viii) Access roads to and on the levee are being properly maintained;

(ix) Cattle guards and gates are in good condition;

(x) Crown of levee is shaped so as to drain readily, and roadway thereon, if any, is well shaped and maintained;

(xi) There is no unauthorized grazing or vehicular traffic on the levees;

(xii) Encroachments are not being made on the levee right-of-way which might endanger the structure or hinder its proper and efficient functioning during times of emergency.

Such inspections shall be made immediately prior to the beginning of the flood season; immediately following each major high water period, and otherwise at intervals not exceeding 90 days, and such intermediate times as may be necessary to insure the best possible care of the levee. Immediate steps will be taken to correct dangerous conditions disclosed by such inspections. Regular maintenance repair measures shall be accomplished during the appropriate season as scheduled by the Superintendent.

(2) *Operation.* During flood periods the levee shall be patrolled continuously to locate possible sand boils or unusual wetness of the landward slope and to be certain that:

(i) There are no indications of slides or sloughs developing;

(ii) Wave wash or scouring action is not occurring;

(iii) No low reaches of levee exist which may be overtopped;

(iv) No other conditions exist which might endanger the structure.

Appropriate advance measures will be taken to insure the availability of adequate labor and materials to meet all contingencies. Immediate steps will be taken to control any condition which endangers the levee and to repair the damaged section.

(c) *Flood walls.*—(1) *Maintenance.* Periodic inspections shall be made by the Superintendent to be certain that:

(i) No seepage, saturated areas, or sand boils are occurring;

(ii) No undue settlement has occurred which affects the stability of the wall or its water tightness;

(iii) No trees exist, the roots of which might extend under the wall and offer accelerated seepage paths;

(iv) The concrete has not undergone cracking, chipping, or breaking to an extent which might affect the stability of the wall or its water tightness;

(v) There are no encroachments upon the right-of-way which might endanger the structure or hinder its functioning in time of flood;

(vi) Care is being exercised to prevent accumulation of trash and debris adjacent to walls, and to insure that no fires are being built near them;

(vii) No bank caving conditions exist riverward of the wall which might endanger its stability;

(viii) Toe drainage systems and pressure relief wells are in good working condition, and that such facilities are not becoming clogged.

Such inspections shall be made immediately prior to the beginning of the flood season, immediately following each major high water period, and otherwise at intervals not exceeding 90 days. Measures to eliminate encroachments and effect repairs found necessary by such inspections shall be undertaken immediately. All repairs shall be accomplished by methods acceptable in standard engineering practice.

(2) *Operation.* Continuous patrol of the wall shall be maintained during flood periods to locate possible leakage at monolith joints or seepage underneath the wall. Floating plant or boats will not be allowed to lie against or tie up to the wall. Should it become necessary during a flood emergency to pass anchor cables over the wall, adequate measures shall be taken to protect the concrete and construction joints. Immediate steps shall be taken to correct any condition which endangers the stability of the wall.

(d) *Drainage structures.*—(1) *Maintenance.* Adequate measures shall be taken to insure that inlet and outlet channels are kept open and that trash, drift, or debris is not allowed to accumulate near drainage structures. Flap gates and manually operated gates and valves on

drainage structures shall be examined, oiled, and trial operated at least once every 90 days. Where drainage structures are provided with stop log or other emergency closures, the condition of the equipment and its housing shall be inspected regularly and a trial installation of the emergency closure shall be made at least once each year. Periodic inspections shall be made by the Superintendent to be certain that:

(i) Pipes, gates, operating mechanism, riprap, and headwalls are in good condition;

(ii) Inlet and outlet channels are open;

(iii) Care is being exercised to prevent the accumulation of trash and debris near the structures and that no fires are being built near bituminous coated pipes;

(iv) Erosion is not occurring adjacent to the structure which might endanger its water tightness or stability.

Immediate steps will be taken to repair damage, replace missing or broken parts, or remedy adverse conditions disclosed by such inspections.

(2) *Operation.* Whenever high water conditions impend, all gates will be inspected a short time before water reaches the invert of the pipe and any object which might prevent closure of the gate shall be removed. Automatic gates shall be closely observed until it has been ascertained that they are securely closed. Manually operated gates and valves shall be closed as necessary to prevent inflow of flood water. All drainage structures in levees shall be inspected frequently during floods to ascertain whether seepage is taking place along the lines of their contact with the embankment. Immediate steps shall be taken to correct any adverse condition.

(e) *Closure structures*—(1) *Maintenance.* Closure structures for traffic openings shall be inspected by the superintendent every 90 days to be certain that:

(i) No parts are missing;

(ii) Metal parts are adequately covered with paint;

(iii) All movable parts are in satisfactory working order,

(iv) Proper closure can be made promptly when necessary;

(v) Sufficient materials are on hand for the erection of sand bag closures and that the location of such materials will be readily accessible in times of emergency.

Tools and parts shall not be removed for other use. Trial erections of one or more closure structures shall be made once each year, alternating the structures chosen so that each gate will be erected at least once in each 3-year period. Trial erection of all closure structures shall be made whenever a change is made in key operating personnel. Where railroad operation makes trial erection of a closure structure infeasible, rigorous inspection and drill of operating personnel may be substituted therefor. Trial erection of sand bag closures is not required. Closure materials will be carefully checked prior to and following flood periods, and damaged or missing parts shall be repaired or replaced immediately.

(2) *Operation.* Erection of each movable closure shall be started in sufficient time to permit completion before flood waters reach the top of the structure sill. Information regarding the proper method of erecting each individual closure structure, together with an estimate of the time required by an experienced crew to complete its erection will be given in the Operation and Maintenance Manual which will be furnished local interests upon completion of the project. Closure structures will be inspected frequently during flood periods to ascertain that no undue leakage is occurring and that drains provided to care for ordinary leakage are functioning properly. Boats or floating plant shall not be allowed to tie up to closure structures or to discharge passengers or cargo over them.

(f) *Pumping plants*—(1) *Maintenance.* Pumping plants shall be inspected by the Superintendent at intervals not to exceed 30 days during flood seasons and 90 days during off-flood seasons to insure that all equipment is in order for instant use. At regular intervals, proper measures shall be taken to provide for cleaning plant, buildings, and equipment, repainting as necessary, and lubricating all machinery. Adequate supplies of lubricants for all types of machines, fuel for gasoline or diesel powered equipment, and flash lights or lanterns for emergency lighting shall be kept on hand at all times. Telephone service shall be maintained at pumping plants. All equipment, including switch gear, transformers, motors, pumps, valves, and gates shall be trial operated and checked at least once every 90 days. Megger tests of all insulation shall be made whenever wiring has been subjected to undue dampness and otherwise at intervals not to exceed one year. A record shall be kept showing the results of such tests. Wiring disclosed to be in an unsatisfactory condition by such tests shall be brought to a satisfactory condition or shall be promptly replaced. Diesel and gasoline engines shall be started at such intervals and allowed to run for such length of time as may be necessary to insure their serviceability in times of emergency. Only skilled electricians and mechanics shall be employed on tests and repairs. Operating personnel for the plant shall be present during tests. Any equipment removed from the station for repair or replacement shall be returned or replaced as soon as practicable and shall be trial operated after reinstallation. Repairs requiring removal of equipment from the plant shall be made during off-flood seasons insofar as practicable.

(2) *Operation.* Competent operators shall be on duty at pumping plants whenever it appears that necessity for pump operation is imminent. The operator shall thoroughly inspect, trial operate, and place in readiness all plant equipment. The operator shall be familiar with the equipment manufacturers' instructions and drawings and with the "Operating Instructions" for each station. The equipment shall be operated in accordance with the above-mentioned "Operating Instructions" and care shall be exercised that proper lubrication is being supplied all equipment, and that no overheating, undue vibration or noise is occurring. Immediately upon final recession of flood waters, the pumping station shall be thoroughly cleaned, pump house sumps flushed, and equipment thoroughly inspected, oiled and greased. A record or log of pumping plant operation shall be kept for each station, a copy of which shall be furnished the District Engineer following each flood.

(g) *Channels and floodways* — (1) *Maintenance.* Periodic inspections of improved channels and floodways shall be made by the Superintendent to be certain that:

(i) The channel or floodway is free of debris, weeds, and wild growth;

(ii) The channel or floodway is not being restricted by the depositing of waste materials, building of unauthorized structures or other encroachments;

(iii) The capacity of the channel or floodway is not being reduced by the formation of shoals;

(iv) Banks are not being damaged by rain or wave wash, and that no sloughing of banks has occurred;

(v) Riprap sections and deflection dikes and walls are in good condition;

(vi) Approach and egress channels adjacent to the improved channel or floodway are sufficiently clear of obstructions and debris to permit proper functioning of the project works.

Such inspections shall be made prior to the beginning of the flood season and otherwise at intervals not to exceed 90 days. Immediate steps will be taken to remedy any adverse conditions disclosed by such inspections. Measures will be taken by the Superintendent to promote the growth of grass on bank slopes and earth deflection dikes. The Superintendent shall provide for periodic repair and cleaning of debris basins, check dams, and related structures as may be necessary.

(2) *Operation.* Both banks of the channel shall be patrolled during periods of high water, and measures shall be taken to protect those reaches being attacked by the current or by wave wash. Appropriate measures shall be taken to prevent the formation of jams of ice or debris. Large objects which become lodged against the bank shall be removed. The improved channel or floodway shall be thoroughly inspected immediately following each major high water period. As soon as practicable thereafter, all snags and other debris shall be removed and all damage to banks, riprap, deflection dikes and walls, drainage outlets, or other flood control structures repaired.

(h) *Miscellaneous facilities* — (1) *Maintenance.* Miscellaneous structures and facilities constructed as a part of the protective works and other structures and facilities which function as a part of, or affect the efficient functioning of the protective works, shall be periodically inspected by the Superintendent and appropriate maintenance measures taken. Damaged or unserviceable parts shall be repaired or replaced without delay. Areas used for ponding in connection with pumping plants or for temporary storage of interior run-off during flood periods shall not be allowed to become filled with silt, debris, or dumped material. The Superintendent shall take proper steps to prevent restriction of bridge openings and, where practicable, shall provide for temporary raising during floods of bridges which restrict channel capacities during high flows.

(2) *Operation.* Miscellaneous facilities shall be operated to prevent or reduce flooding during periods of high water. Those facilities constructed as a part of the protective works shall not be used for purposes other than flood protection without approval of the District Engineer unless designed therefor. (49 Stat. 1571, 50 Stat. 877; and 55 Stat. 638; 33 U.S.C. 701c; 701c-1) (Regs. 9 August 1944, CE SPKWP)

[SEAL] J. A. ULIO,
Major General,
The Adjutant General.

[F. R. Doc 44-12286: Filed, August 16, 1944; 9:01 a. m.]

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APPENDIX B

STANDARD OPERATING PROCEDURES

DURING FLOOD PERIODS

APPENDIX B

STANDARD OPERATING PROCEDURES DURING FLOOD PERIODS

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APPENIX B

STANDARD OPERATING PROCEDURE DURING FLOOD PERIODS

SCOPE

1. GENERAL

This appendix prescribes details for the operation of flood control features of the Hartland, Maine (Sebasticook River) Local Protection Project prior to and during flood periods. Climatologic and hydrologic data are included for background information.

RESPONSIBILITIES

2. TOWN OF HARTLAND

The town is responsible for the entire flood protection works. Instructions for the operation are presented in this appendix. Areas of responsibility include (See plate B-1 for an overall plan and profile of the project):

a. Complete operation of the project during flood periods.

b. Determining phases of preparedness, mobilization and operations based on:

1. National Weather Service river and weather forecasts.

2. Current level of Great Moose Lake.

3. River stage at project staff gage (North Street).

4. River level at downstream end of project in vicinity of stoplog gate.

c. Training personnel in specific duties and holding periodic practice sessions to insure efficient and effective maintenance and operation.

d. Maintaining adequate contact with the National Weather Service to obtain weather and flood forecasts.

3. CORPS OF ENGINEERS

The Reservoir Control Center (RCC) of the Corps of Engineers continually monitors rainfall and runoff conditions in much of New England. This climatologic and hydrologic information is available upon request. RCC will review operational procedures following major floods to determine whether the prescribed regulation instructions need revision.

4. NATIONAL WEATHER SERVICE

The National Weather Service (NWS) has no direct role in the operation of the project. However, it has the responsibility of issuing weather and flood forecasts to the general public. Flood forecasts for the Kennebec River Basin are issued by the NWS office at Portland, Maine.

CLIMATOLOGY

5. GENERAL

The Sebasticook River basin has a variable climate characterized by frequent but generally short periods of heavy precipitation. The basin lies in the path of "prevailing westerlies" and is exposed to cyclonic disturbances that cross the country from the west or southwest towards the east or northeast. The area is also subject to coastal storms that travel up the Atlantic Seaboard in the form of hurricanes of tropical origin or storms of extratropical nature, locally called "northeasters". Winters in the basin are moderately severe with most of the winter precipitation occurring as snow. Temperatures in the minus "forties" have been recorded. The spring melting of the winter snow cover usually occurs in the months of April and May.

6. PRECIPITATION AND SNOWFALL

Average annual precipitation in the Sebasticook River basin is about 40 inches. The mean annual snowfall over the basin is about 85 inches. Snow cover ususally reaches a maximum depth in late March or early April with water content normally ranging from 6 to 8 inches. Melting snow usually results in heavy spring runoff. Melting snow alone or in combination with heavy rains pose a flood threat every spring. Table B-1 summarizes monthly precipitation and snowfall data.

7. RUNOFF

The US Geological Survey has recorded flows of the Sebasticook River at a gage in Pittsfield, Maine since 1929. The drainage area at the gage is 579 square miles, whereas the drainage area at Hartland is 235 square miles. The long-term hydrologic record at Pittsfield was used extensively for reference in the hydrologic analysis for Hartland.

The average annual runoff, as recorded at Pittsfield, is 959 cfs which is equivalent to 22.7 inches of runoff or somewhat more than 50 percent of mean annual precipitation.

The peak recorded flow at Pittsfield was 14,400 cfs occurring in March 1936. The flow at Hartland for this flood event, based on known high water and hydraulic computations, was estimated to be about 6,000 cfs. The mean, maximum, and minimum monthly runoff, as recorded at Pittsfield, is listed in Table B-2.

Table B-1

PRECIPITATION AND SNOWFALL DATA
AT MADISON, MAINE

	Monthly Precipitation (Inches) (1)			Average Monthly Snowfall (Inches) (2)
Month	Mean	Maximum	Minimum	Snowfall
January	3.13	7.91	0.66	21.5
February	2.85	5.92	0.63	19.8
March	3.31	11.04	0.31	14.1
April	3.37	7.63	0.77	5.5
May	3.36	7.25	0.23	0.3
June	3.48	9.96	0.95	0.0
July	3.42	10.53	0.34	0.0
August	3.35	7.38	0.35	0.0
September	3.53	10.04	0.47	0.0
October	3.45	8.64	0.05	0.5
November	3.76	9.29	0.28	6.3
December	3.47	11.28	1.11	17.8
Annual	40.46	59.97	26.93	85.6

(1) 77 Years of Record
(2) 43 Years of Record

Table B-2

MONTHLY RUNOFF
SEBASTICOOK RIVER NEAR PITTSFIELD, MAINE
48 Years of Record
Drainage Area = 579 sq. mi.
(D.A. at Hartland = 235 sq. mi.)

Mean Discharge in Cubic Feet Per Second and Inches

Month	Mean		Maximum		Minimum	
	cfs	Inches	cfs	Inches	cfs	Inches
January	695	1.4	1815	3.6	152	0.3
February	688	1.2	3576	6.5	130	0.2
March	1266	2.5	5764	11.6	350	0.7
April	3505	6.8	5768	11.2	1556	3.0
May	1509	3.0	3202	6.4	453	0.9
June	587	1.1	1760	3.4	167	0.3
July	368	0.7	1914	3.8	78	0.2
August	295	0.6	1664	3.3	84	0.2
September	362	0.7	3447	6.7	98	0.2
October	727	1.5	1528	3.1	80	0.2
November	860	1.7	2913	5.7	67	0.2
December	1057	2.1	4609	9.3	73	0.2
Annual	959	22.7	1645	38.9	476	11.3

HISTORY OF FLOODS

8. GENERAL

Though floods can occur any season of the year at Hartland, historically most of the high flows have occurred as a result of high volume spring runoff rather than as a result of high intensity rainfall associated with coastal storms. Noteworthy floods have occurred on the Sebasticook River in May 1923, March 1936, April 1940, March 1953, December 1973 and more recently in June 1984. The June 1984 flood is evidence that floods can occur any season of the year and was the result of six days of prolonged heavy rainfall totaling about 7.0 inches. An estimated peak discharge of approximately 5000 cfs at Hartland, for the June 1984 flood, was based on river level observations by Corps field personnel as well as by local town personnel.

Table B-3 lists the five floods of record discharges, in order of magnitude, of Pittsfield along with estimated flows at Hartland.

TABLE B-3

PEAK FLOWS
SEBASTICOOK RIVER

Date	Pittsfield, ME (D.A. = 579 sq. mi.)	Hartland, ME (D.A. = 235 sq. mi.)
March 1936	14,400 cfs	6,000 cfs
June 1984	10,500	5,000
April 1940	11,300	5,000
March 1953	10,900	4,500
December 1973	10,300	4,200

9. FREQUENCY OF FLOODING

Table B-4 provides the project superintendent with a background on frequency of flooding of the Sebasticook River along the local protection project. The project staff gage at the North Street bridge was selected as an index station where flood levels can be readily determined.

10. ANALYSIS OF FLOODING

The Sebasticook River basin has considerable natural valley storage as well as surcharge storage in numerous lakes and ponds. Therefore, the peak outflow from the basin is considered more a function of volume of runoff rather than rate of rainfall and/or watershed runoff. An analysis was, therefore, made of the record March 1936 and December 1973 floods, as recorded at Pittsfield, to establish a relationship between peak flow and volume of runoff. The relationship was developed for the volume of runoff

and incremental peak flow over and above the high antecedent base flow. It was established that once conditions were met for a high base flow at Pittsfield of about 3,000 cfs, an additional 2,000 cfs of outflow could be expected for every inch of runoff volume over and above the base flow volume. This relationship, and the base flow condition, was then transferred from Pittsfield to Hartland by applying a factor equal to the ratio of drainage area. This resulted in about 1,000 cfs incremental outflow rate at Hartland for every 1 inch volume of runoff above a base flow of about 1,500 cfs. In other words, an excess volume of 5 inches over and above a base flow of 1,500 cfs at Hartland would produce a peak flow at Hartland of about 6,500 cfs.

TABLE B-4

FREQUENCY OF FLOODING
SEBASTICOOK RIVER AT PROJECT STAFF GAGE (NORTH STREET)

Estimated Frequency (Years)	Staff Gage Reading * (Ft. NGVD)	Discharge (cfs)
Design Flood (SPF)	239.6	8,000
100	238.5	6,200
50	238.1	5,500
20	237.6	4,700
10	237.1	4,000
5	236.7	3,400
2	236.1	2,600

* Bottom of staff gage is elevation 234.0 feet NGVD

11. DESIGN FLOOD

The protective earth dikes and concrete floodwalls along the Sebasticook River were designed for the adopted standard project flood discharge of 8,000 cfs plus 3 feet and 2 feet of freeboard, respectively. The earth dike across the low area of Great Moose Lake was designed to prevent floodflows from circumventing the Great Moose Lake dam and spillway. The dike has a top elevation of 252.0 feet NGVD, which is 2.6 feet higher than the top elevation of the existing main dam at Great Moose Lake.

DESCRIPTION OF OPERATIONAL ELEMENTS

12. GENERAL

This section briefly describes the elements of the flood protection works and related equipment that town personnel will operate prior to and during floods. These elements consist of two portable interior drainage pumps, a gate valve structure, flap gate, and a stoplog gate vehicle access opening. A general plan of the interior drainage appurtenances are shown on Plate B-2.

13. INTERIOR DRAINAGE SYSTEM

The flood protective works will intercept runoff from 6.4 acres of interior area lying between Commercial and Elm Streets and the line of protection. The downstream end of the Irving Tanning Company raceway channel was contoured to provide an 8,400 square foot area two feet deep emergency ponding area. When river levels are low the interior runoff flows by gravity through the 18-inch conduit, which is equipped with a gate valve and flap gate, where it discharges into the river. The conduit is designed to discharge runoff from a 100-year rainfall storm. When river levels are high the flap gate on the 18-inch conduit will close to prevent backflow from occurring in the conduit. If debris or ice are present to prevent the flap gate from fully closing, then the gate valve on the conduit will be manually closed. Interior runoff, occurring at this time, will be temporarily stored within the contoured area where it will be pumped to the river by two portable pumps.

14. PORTABLE PUMPS

The project is equipped with two portable interior drainage pumps. Each of the pumps has a discharge capacity of 1,200 gpm for a total pumping capability of 2,400 gpm (5 cfs). This is equivalent to a total interior runoff rate of 0.7 inch per hour. When pumping is required, the suction hoses on the portable pumps will be placed within the drain inlet that was constructed on the 18 inch gravity conduit and located within the ponding area just upstream of the 18-inch gate valve. This drain inlet is used as the "sump" for pumping purposes (see location on Plate B-2).

15. STOPLOG GATE

One opening through the floodwall for vehicular traffic will be closed by a wooden stoplog gate prior to the river reaching flood stage. The stoplog gate is 12 feet wide by 8 feet high and is located at the south end of the project as shown on Plate B-2. The gate is normally opened and when river levels begin to rise wooden stoplogs are placed within the opening, while placing sandbags on the riverside of the gate for total closure during flood stage. The sill elevation of the stoplog gated opening is 223.0 feet NGVD.

OPERATIONAL CONSIDERATIONS

16. GENERAL

There are numerous items that must be considered and weighed in prescribing operational procedures for this project. The principal considerations are:

a. National Weather Service Forecasts of possible flooding.

b. Current level of Great Moose Lake.

c. River level at project staff gage (North Street).

d. Time needed by the superintendent to mobilize personnel associated with operation of the project.

e. Activation time required for the portable pumps, gravity conduit gate valve, and vehicular access stoplog gate.

f. Observations along the walls, dikes and stoplog gate during floodflows to detect any leaks, obstructions or problem areas.

17. MOBILIZATION

a. Portable Pumps. The time required to mobilize personnel and activate the portable pumps for a flood is dependent on many items and presently can only be estimated. In order to provide sufficient time to overcome forseeable weather, mechanical or personnel difficulties, mobilization and staffing of the portable pumps will be completed when the river level rises to within 1 foot below the sill of the stoplog opening and rising.

It is estimated that a minimum of three persons are required to mobilize and activate the portable pumps. Once the pumps are activated it is estimated that only one person would be capable of operating the pumps, read the gages and maintain an operations log while the other two persons lend support to additional crews.

b. Stoplog Gate. Mobilization of the crew for stoplog vehicle access gate closure will begin when a rising river stage is within 1 foot of the sill of the stoplog gate. It is estimated that a crew of four persons with a truck mounted crane apparatus will be required to place the wooden stoplogs within the gate opening while placing sandbags on the riverside of the gate. It is anticipated that one of the additional persons in the pump crew would be part of this stoplog gate crew once the pumps have been activated.

During flood periods the protective works shall be patrolled continously to locate possible leakage at dikes, floodwalls and stoplog gate. The four persons in the stoplog gate crew and the two additional persons in the pump crew will become the patrol crew once the gate has been closed and sandbagged and pumping operations have been started. This crew should be thoroughly instructed as to their duties, what they are to watch for and the exact limit of their patrol.

OPERATIONAL PHASES AND INSTRUCTIONS FOR FLOODS

18. OPERATIONAL PHASES

The project superintendent should be watchful during late winter for warm days with rainfall that could start runoff from snowmelt as well as other hydrologic conditions such as prolonged periods of heavy rainfall, like the storm associated with the June 1984 flood, which could cause high riverflows. The operational functions have been divided into "phases" to assure a clear delineation of actions to be taken prior to and during flood conditions and are outlined below:

Phase 1 - Project Superintendent alerts crew for possible flood operations.

Phase 2 - Begin staffing operations.

Phase 3 - Begin flood operations.

Phase 4 - Cessation.

In order to simplify operational phases, all river stages referred to in the instructions (paragraph 19) are considered relative to the bottom sill of the stoplog gate which is at elevation 223.0 feet NGVD.

19. INSTRUCTIONS

This section contains instructions to be followed by personnel operating the project during flood periods. The instructions have been summarized and are shown on Plate B-3.

a. Phase 1. The National Weather Service issues a "flood watch" for the region of Maine including the Kennebec and Sebasticook Rivers. The project superintendent will alert all personnel connected with the operation of the project and will closely follow National Weather Service reports. The superintendent will inform his crew to commence recording water levels at the project staff gage, at the stoplog gate and at Great Moose Lake at least twice a day. Phase 1 may also be initiated for (1) prolonged periods of heavy rain and/or melting snow with warm temperatures, or (2) river level reading at project staff gage is 236.0 feet NGVD or (3) river level at project stoplog gage is within 2 feet of the bottom sill of the gate and rising.

b. Phase 2. Position portable pumps, readied for activation, when the following conditions develop.

1. The National Weather Service forecasts flood stages on the Kennebec and/or the Sebasticook Rivers.

2. The river level is within 1 foot of the bottom sill of the stoplog gate and rising.

Phase 2 includes the following operations:

1. Position both portable pumps, readied for activation, by placing suction hoses within the drain inlet on the 18-inch gravity conduit, which is located near the gate valve as shown on Plate B-2.

2. Mobilize all work crews.

c. Phase 3. Activate the portable pumps when the river level is within one-half foot of the stoplog gate sill and is expected to rise over the sill elevation. Check gravity conduit flap gate to insure it is fully closed and if needed close the 18-inch gravity conduit gate valve. Operate pumps as needed. Begin placing stoplogs within opening while sandbagging riverside of gate.

d. Phase 4. Deactivate pumping as needed, or when the river level recedes to below the sill of the stoplog gate and is expected to continue to fall. If the 18-inch gate valve on the gravity conduit was closed during pumping operations it should be opened at this time. Remove stoplogs as needed while the river level falls and fully open stoplog gate when the river falls to below one-half foot of the gate sill and is expected to continue falling.

Operation will revert to phase 1 until the river level falls below 2 feet of the bottom sill of the stoplog gate and is expected to continue to fall.

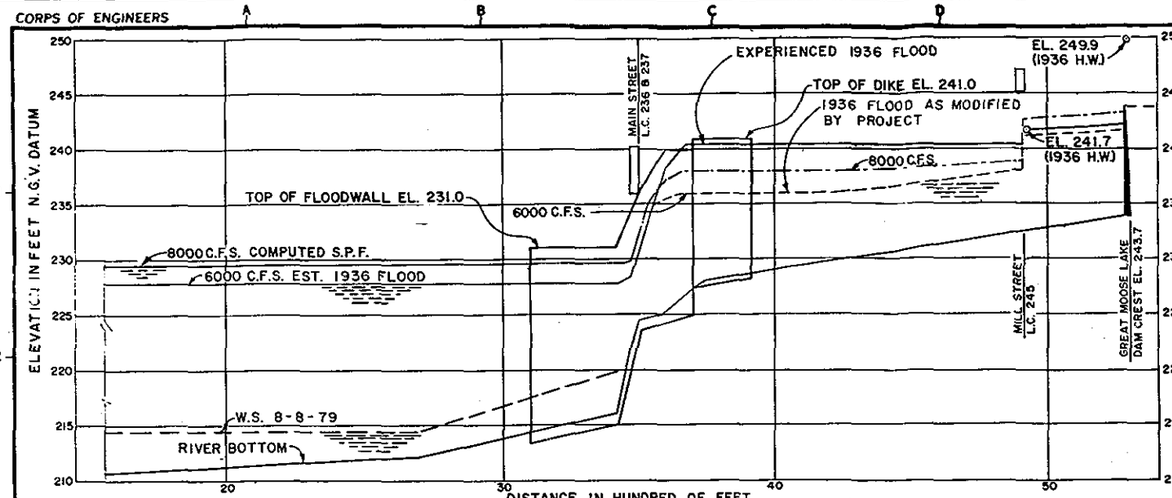
For sample flood operations refer to Plate B-4 which demonstrates project operation for the experienced March 1936 flood.

20. REPORTS

Prior to and during the operation of the project, information pertinent to a flood operation will be entered in a log of reports as shown on Plate B-4. The flood report will include pumping operations, hourly river levels at the project staff gage as well as relative to the stoplog gate sill, hourly levels at Great Moose Lake, a log of stoplog gate as well as 18-inch gate valve closures and any problems or observations that would help in evaluating the operational procedures and prescribed regulation. Project staff gage readings at the North Street bridge are necessary in order to determine the discharge associated with a particular flood as well as aid the Reservoir Control Center, Corps of Engineers, in their evaluation of flood control benefits, afforded by the project during flood events.

CORPS OF ENGINEERS

U. S. ARMY



SEBASTICOOK RIVER PROFILE

SCALE: HORIZ. 1"=200'
VERT. 1"=5'

GENERAL PLAN

SCALE: 1"=100'

GRAPHIC SCALES

1"=200' 200' 0 200' 400'

1"=100' 100' 0 100' 200'

1"=8' 5' 0 5' 10'

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

KENNEBEC RIVER BASIN
SEBASTICOOK RIVER
PLAN AND PROFILE
HARTLAND, MAINE LOCAL PROTECTION
HYDROLOGIC ENGINEERING SECTION FEB. 1980

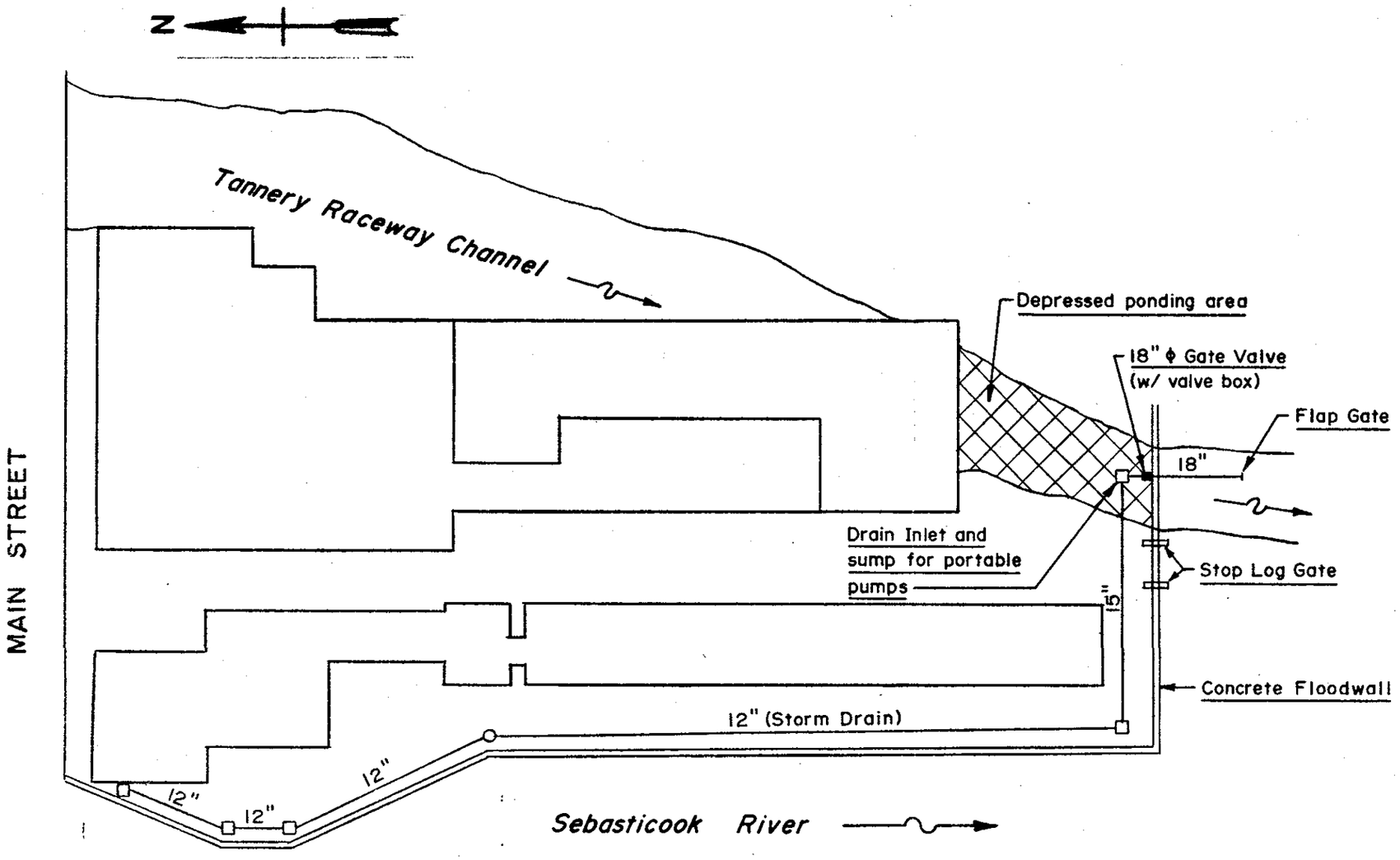
APPROVED DATE

CHIEF, DIVISION

SCALE SPEC. NO.

DRAWING NUMBER

PLATE 8-1



(NOT TO SCALE)

WATER RESOURCES DEVELOPMENT PROJECT
HARTLAND, MAINE
LOCAL PROTECTION PROJECT
INTERIOR DRAINAGE

PLATE B-2

STANDARD OPERATING PROCEDURE FOR FLOODS
HARTLAND, MAINE LOCAL PROTECTION PROJECT

PHASE		CONDITION	PERSONNEL	GRAVITY CONDUIT VALVE	PUMPS
		Normal	Inactive	Gravity Conduit - Open	Idle
1	ALERTING	a. National Weather Service (NWS) issues a "flood watch" for this region of Maine b. Heavy rain or melting snow with warm temperatures. c. River level reading at project staff gage is 236.0 feet NGVD and rising. d. River level at project stoplog gate is 2 feet below bottom sill of gate and rising.	All personnel will be alerted	Normal	Idle
2	STAFFING	a. NWS issues a "flood warning" for Kennebec/ Sebasticook Rivers. b. River level within 1 foot of the bottom sill of the stoplog gate.	Mobilize and position portable pumps Mobilize all work crews	Normal	Idle
3	OPERATING	River level within one-half foot of the bottom sill of stoplog gate and rising and expected to overtop the sill.	a. Start pumping as needed and close 18 inch gravity conduit gate valve if necessary. b. Begin placing stoplogs as needed while sandbagging riverside of gate.	Close if necessary*	Operate
4	CESSATION	River level recedes to one-half foot below stoplog gate sill and falling.	a. Stop pumping and open gravity conduit gate valve if it was in closed position. b. Remove stoplogs from gate.	Open if necessary*	Stop
1		Phase 1 remains in effect until flooding no longer threatens the area and river level recedes to below 2 feet of stoplog gate sill and falling.	All personnel remain on alert status.	Normal	Idle

*If flap gate on gravity conduit is unable to fully close due to debris or ice conditions, then the 18 inch gate valve will be manually closed.

WATER RESOURCES DEVELOPMENT PROJECT

HARTLAND, MAINE

LOCAL PROTECTION PROJECT

SAMPLE OPERATION
MARCH 1936 FLOOD

SEBASTICOOK RIVER MAINE

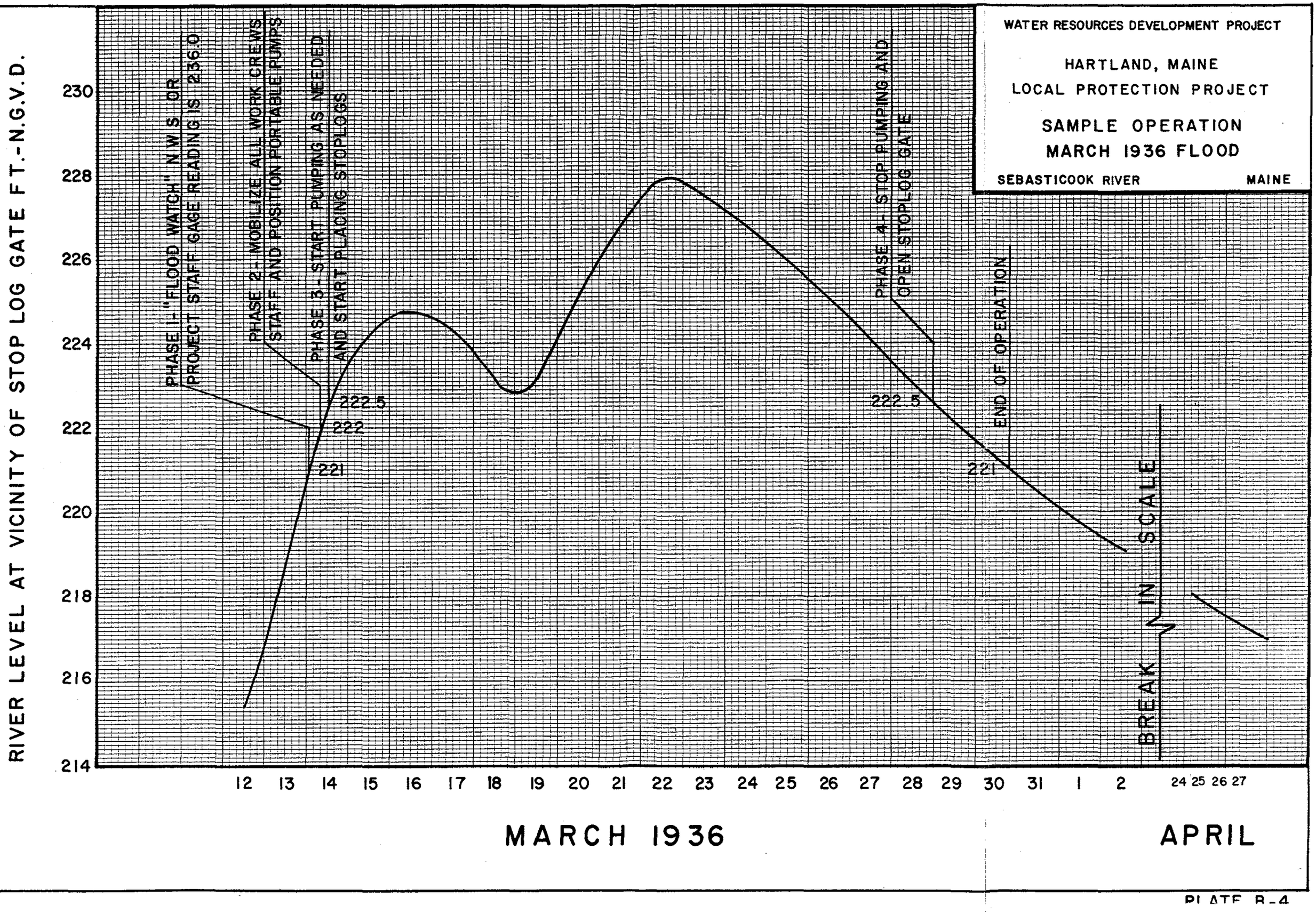


PLATE B-4

HARTLAND LOCAL PROTECTION
OPERATION LOG

Time	Project Staff Gage Reading	Great Moose Lake Level	River Level* at Stoplog Gate	Pump		Remarks (Include Log of Stoplog Gate and 18" Gate Valve Closures)
				No. 1	No. 2	

*Stage in feet relative to sill of stoplog gate

DI ATE D-1

APPENDIX C

REPORT FORMS

DESIGNATION OF SUPERINTENDENT

Name of Project: _____

Location: _____

MAINTAINING MUNICIPAL AGENCY:

Agency: _____

Address: _____ Tel. No. _____

"SUPERINTENDENT" - As required by Section 208.10 (a) (2), Chap. II, Title 33 USC

Name & Title: _____

Employed By: _____

Business Address: _____

Business Tel. No: _____

Nights, Sundays, Address: _____

Nights, Sundays, Tel. No: _____

Remarks:

Signed: _____

Title: _____

Date: _____

NOTE: To be submitted and updated as necessary by the responsible agency which will maintain and operate the works in accordance with regulations prescribed by the Secretary of the Army as required by law (Title 33, Chap. 208, Sec. II, USC).

CHECK LIST INSPECTION REPORT
HARTLAND LOCAL PROTECTION

Use with NED Form 513 - Inspection Report

1. Portable Pumps

   Pumps, Motors, Engines

   (1) When Trial Operated _____
   (2) Oil Changes _____
   (3) Lubrication _____
   (4) Metal Intakes, Etc. _____
   (5) Diesel Fuel _____

2. Drainage Structures

   a. Valves _____

      (1) When Trial Operated _____
      (2) General Condition _____
      (3) Leaks _____
      (4) Lubrication _____
      (5) Painting _____

   b. Structure

      (1) Date inspected by Superintendent _____
      (2) General Condition _____
      (3) Trash Racks _____
      (4) Miscellaneous _____

3. Dikes

   a. Date Inspected by Superintendent _____
   b. General Condition _____
   c. Condition of slopes/erosion/ grass _____
   d. Condition of top _____
   e. Sand boils/caving _____
   f. Are there any burrowing animal holes in dike _____
   g. Trespassing
      (1) Are there any paths on dike _____
      (2) Has right-of-way been for dumping of stroage materials _____

h. Condition of rock slope protection _____

i. Describe deficiencies, including location, and corrective measures planned _____

_____

_____

_____.

4. Stop logs

a. Condition of logs _____
b. Availability of logs _____
c. Correct number of logs _____
d. Condition of stop log slots _____
e. Condition of storage facilities _____

5. Channel

a. Date inspected by Superintendent _____
b. General condition of channel _____
c. Has the capacity of channel been reduced due to growth of vegetation, shoaling, or other encroachments? _____
d. General condition of rock slope protection _____
e. Has there been any removal of rock? _____
f. Has there been any movement of rock slope protection? _____
g. Describe deficiencies, including location, and corrective measures planned _____

_____

_____.

6. Concrete Structures (Floodwalls, Stop-Log, etc.)

a. Date inspected by Superintendent _____
b. General condition of concrete _____
c. Any evidence of surface deterioration?
d. Any development of cracks? _____
e. Any evidence of movement or settlement? _____
f. Any cracking or spalling of concrete at joints? _____

g. Describe deficiencies, including location, and corrective measures planned _____

_____

_____

7. Miscellaneous

a. Is emergency operation plan up-to-date? _____
b. Is sufficient emergeny equipment available at all times? _____
c. Is sufficient manpower avialable at all times? _____
d. Is the emergency equipment in good working condition? _____
e. Has the semi-annual report been submitted? _____

8. General

a. Have all deficiencies noted in previous Inspection Report been corrected? _____

b. Has any high water been experienced since the last Inspection Report? _____

If so, describe briefly, including dates, height of water, and effect on protective works. _____

_____

_____

9. Remarks and Additional Comments

Indicate Observations, Discussions, Specific Featues Deficiencies, Recommendations and any other pertinent information. Use continuation sheet if necessary.

LOCAL FLOOD PROTECTION PROJECT INSPECTION REPORT

Project:

Maintaining Agency:

Type Inspection: _____Semi-Annual Staff ____90 Day Interim

River Basin: Date of Inspection

Feature	Sat	Unsat	Deficiencies
PUMPING STATIONS - STRUCTURES			
INTERIOR			
EXTERIOR			
PUMPS - MOTORS - ENGINES			
TRIAL OPERATED			
GENERAL CONDITION			
POWER SOURCE			
INSULATION TESTS			
METAL INTAKES/OUTLETS			
GATE VALVES			
GATES - DRAINAGE STRUCTURES			
TRIAL OPERATED			
GENERAL CONDITION			
LUBRICATION			
DIKES - DAMS			
GENERAL CONDITION			
SLOPES/EROSION			
SAND BOILS/CAVING			
TRESPASSING			
SLOPE PROTECTION			
DRAINS			
STOP-LOGS - LOG BOOM			
CONDITION OF LOGS			
AVAILABILITY OF LOGS			
HIGHWAY SLOTS			
STORAGE FACILITIES			
CHANNELS - OUTLET WORKS CHANNEL			
BANKS			
OBSTRUCTION CONTROL			

Feature	Sat	Unsat	Deficiencies
CONCRETE STRUCTURES			
SURFACE			
SETTLEMENT			
JOINTS			
DRAINS			
MISCELLANEOUS			
EMERGENCY OPER. PLAN			
EMERGENCY EQUIPMENT			
SEMI-ANNUAL REPORT			

Inspection Party:

Photographs Taken:

Remarks & Additional Comments:

(Indicate Here Observations, Discussions, Specific Feature Deficiencies, Recommendations and any other pertinent information. Use Continuation Sheet if necessary.)

X ALL APPLICABLE ITEMS. IF UNSAT INDICATE SPECIFIC DEFICIENCIES. INDICATE IF NOT APPLICABLE.

DATE	INSPECTED BY: TYPED NAME & TITLE	SIGNATURE

APPENDIX D

ASSURANCES OF LOCAL COOPERATION

TOWN OF HARTLAND

AGREEMENT BETWEEN

THE UNITED STATES OF AMERICA

AND

THE TOWN OF HARTLAND

FOR LOCAL COOPERATION AT

THE SEBASTICOOK RIVER

HARTLAND, MAINE

THIS AGREEMENT entered into this 16th day of June, 1982 by and between the UNITED STATES OF AMERICA (hereinafter called the "Government"), represented by the Contracting Officer executing this agreement, and the TOWN OF HARTLAND, MAINE (hereinafter called the "Town"), acting by and through its Board of Selectmen, WITNESSETH THAT:

WHEREAS, construction of the flood protection project on the Sebasticook River in Hartland, Maine, consisting of construction of a dike and concrete walls, the removal of mill dam and excavation of the river bottom, (hereinafter called the "Project"), was approved by the Chief of Engineers on 9 March 1982 under authority granted by Section 205 of the 1948 Flood Control Act, as amended by the Water Resources Development Act of 1974, Section 61 (2), Public Law 93-251, 33 U.S.C.A 701S, approved 7 March 1974;

WHEREAS, the Town hereby represents that it has the authority and capability to furnish the non-Federal cooperation required by Federal legislation authorizing the Project, and by other applicable law;

NOW, THEREFORE, the parties agree as follows:

1. The Town agrees that, if the Government shall commence construction of the local flood protection project at the Sebasticook River at Hartland, Maine, substantially in accordance with Federal legislation authorizing

such Project, Section 205 of the 1948 Flood Control Act, as amended, they shall in consideration of the Government commencing construction of such Project, fulfill the requirements of non-Federal cooperation in such legislation, to wit:

a. Provide without cost to the United States all lands, easements, rights-of-way necessary for project construction.

b. Hold and save the United States free from damages due to the construction, operation and maintenance of the project except where such damages are due to the fault of the United States or its contractors.

c. Maintain and operate the project after completion without cost to the United States in accordance with regulations prescribed by the Secretary of the Army.

d. Assume full responsibility for all project costs in excess of the Federal Cost limitation of $4 million. The Federal cost limitation includes costs of all investigations, planning, engineering, supervision, inspection and administration involved in development and construction.

e. Prevent future encroachment which might interfere with proper functioning of the project for flood control. This would include a provision that no new construction between the Great Moose Lake Dam and Main Street occur below EL. 240.0 ft. NGVD.

f. Comply with the requirements of non-Federal cooperation specified in Sections 210 and 305 of Public Law 91-646 approved 2 January 1971 entitled the "Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970.

2. The Town hereby gives the Government a right to enter upon, at reasonable times and in a reasonable manner, lands which the Town owns or controls, for access to the Project for the purposes of inspection, and for the purpose of operating, repairing and maintaining the Project, if such inspection shows that the Town for any reason is failing to repair and maintain the Project in accordance with the assurances hereunder and has persisted in such failure after a reasonable notice in writing by the Government delivered to the Town officials. No operation, repair and maintenance by the Government in such event shall operate to relieve the Town of responsibility to meet its obligations as set forth in paragraph 1 of this agreement, or to preclude the Government from pursuing any other remedy at law or equity.

IN WITNESS WHEREOF, the parties hereto have executed this contract as of the day and year first above written.

THE UNITED STATES OF AMERICA

BY _____
C. E. EDGAR, III
Colonel, Corps of Engineers
Division Engineer
Contracting Officer

FOR THE SECRETARY OF THE ARMY

DATE 1 July 1982

TOWN OF HARTLAND

BY _____
Edward L. Langston

_____
Burton E. Jones

_____
LeRoy V. Pollman

Board of Selectmen

CERTIFICATE OF AUTHORITY

I Michael A. Wiers, do hereby certify that I am the Town Counsel for the Town of Hartland; that the Board of Selectmen of the Town of Hartland is a legally constituted public body with full authority and legal capability to perform the terms of the agreement between the United States of America and the Town of Hartland in connection with Hartland Local Flood Protection Project and to pay damages, if necessary, in the event of the failure to perform in accordance with Section 221 of Public Law 91-611 and that the persons who have executed the contract on behalf of the Town of Hartland have acted within their statutory authority.

In Witness Whereof, I have made and executed this Certificate this sixteenth day of June 1982.

/s/ Michael A. Wiers

TOWN COUNSEL

CERTIFICATION

I, Carolyn J. Connell, do certify that I am Town Clerk of the Town of Hartland, Maine, named herein, that Edward L. Leighton, Burton L. Jones, and Lesley L. Robbins, who signed this Agreement on behalf of the Town of Hartland, were then and there duly elected and qualified Selectmen of the Town of Hartland; that said Agreement was duly signed for and on behalf of the Town of Hartland, by virtue of their authority as Selectmen and is within the scope of their statutory powers. I further certify that Michael Wiers was the Town Counsel on the date of his approval of the Agreement.

IN WITNESS WHEREOF, I have hereunto affixed my hand and seal of the Town of Hartland, this 21st day of June, 1982.

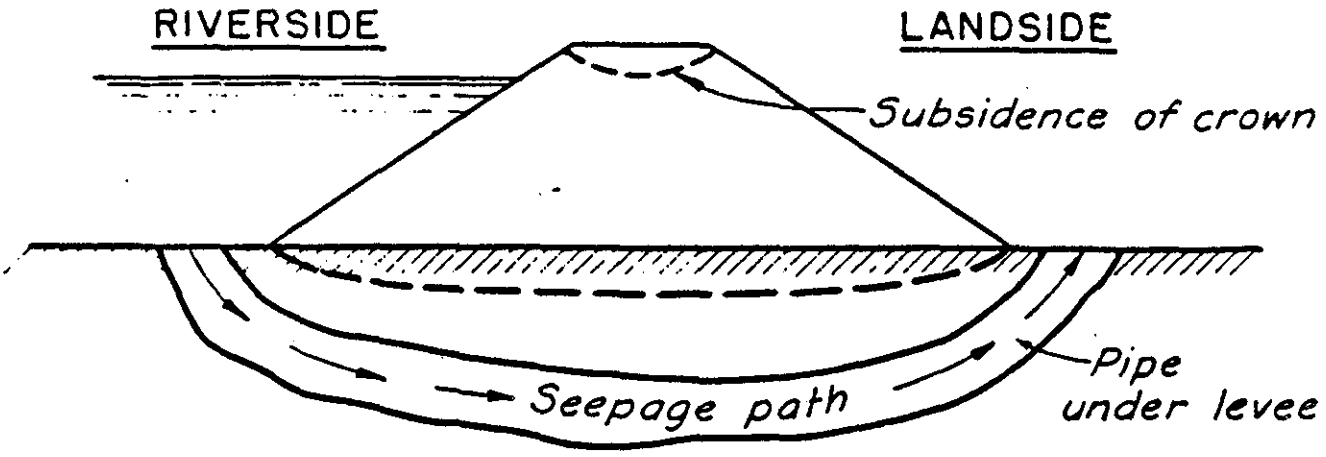
Carolyn J Connell
Town Clerk

(Town Seal)

APPENDIX E

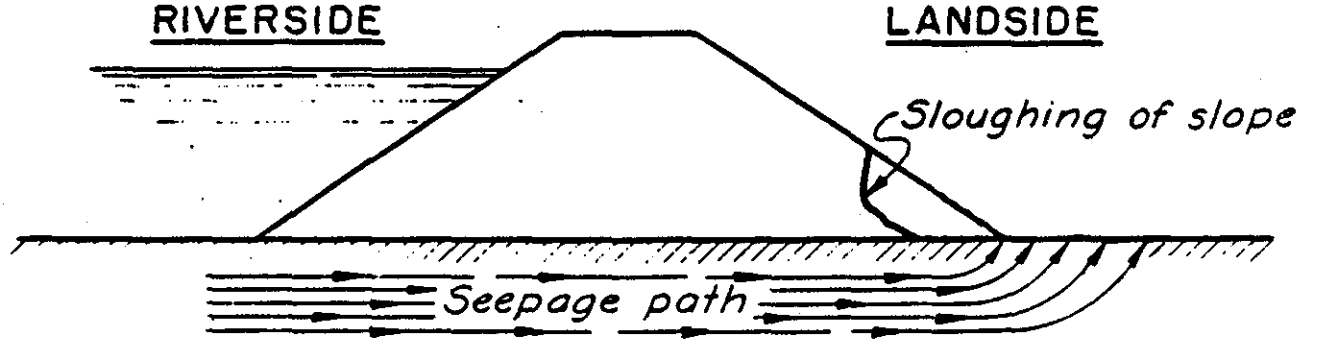
FLOOD EMERGENCY MEASURES

EFFECTS OF SAND BOILS ON LEVEE



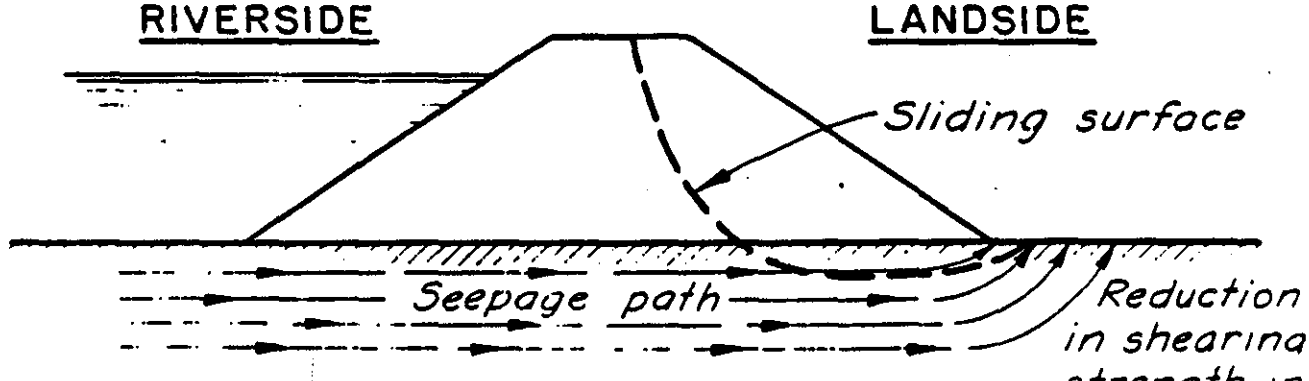
DEVELOPMENT OF PIPE UNDER LEVEE

Fig. 1



SLOUGHING OF LANDSLIDE SLOPE DUE TO RAVELLING AND UNDERCUTTING OF TOE

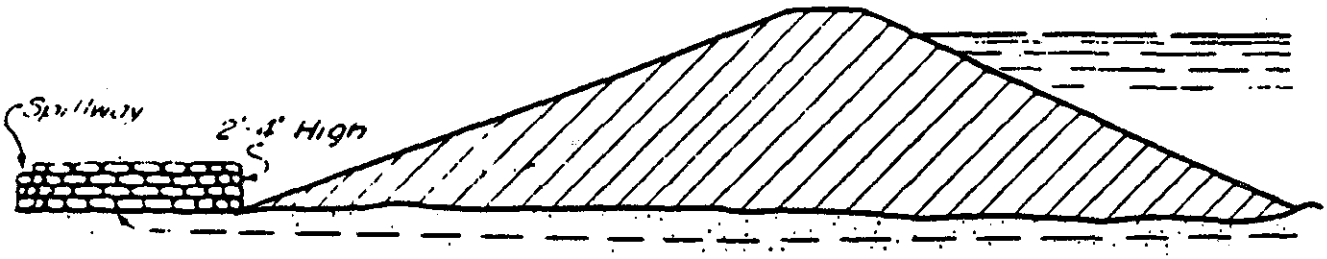
Fig. 2



DEVELOPMENT OF SHEAR SLIDE

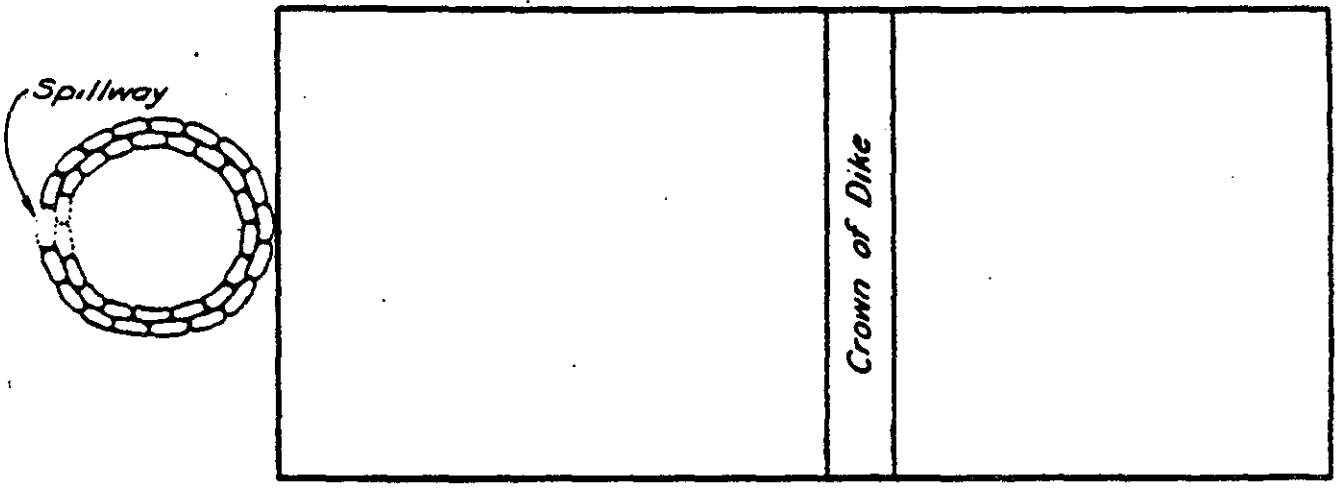
Fig. 3

PLATE NO. I



ELEVATION

Wall should be built on firm foundation, with width of base at least 1½ times the height.
Be sure to place sacks on ground clear of sand discharge.
Tie into dike if boil is near toe.



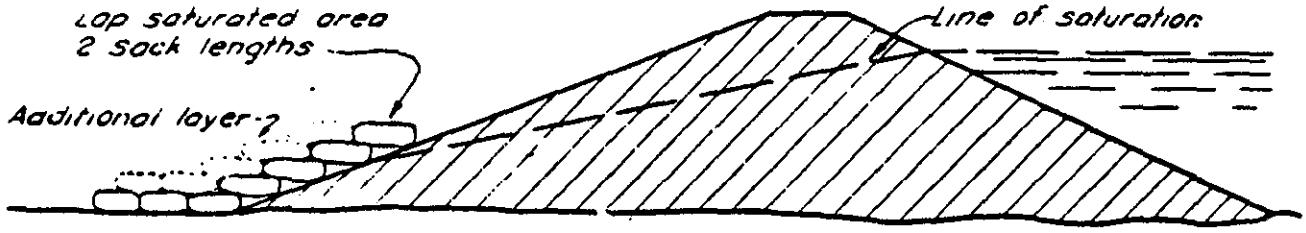
PLAN

Do not sack boil which does not put out material. Height of sack loop or ring should be only sufficient to create enough head to slow down flow through boil so that no more material is displaced and boil runs clear. Do not try to stop fully, flow through boil

SAND BOIL STANDARD HIGH WATER MAINTENANCE INSTRUCTION

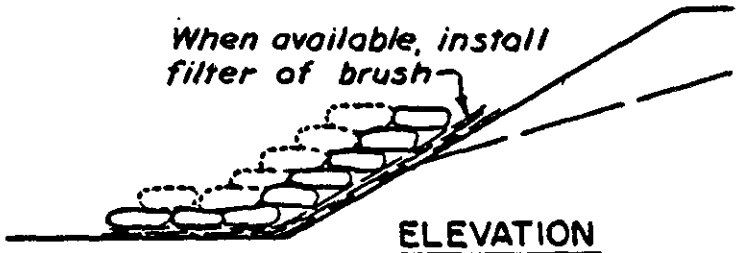
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS

PLATE NO. II

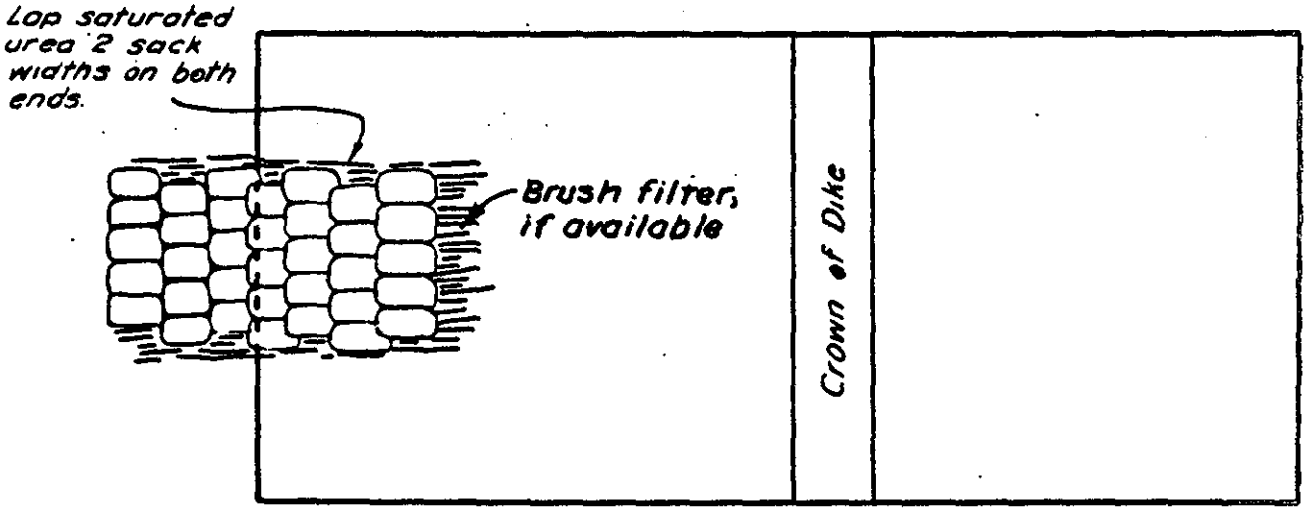


ELEVATION

Number of layers determined by velocity of seepage and amount of material being carried



ELEVATION



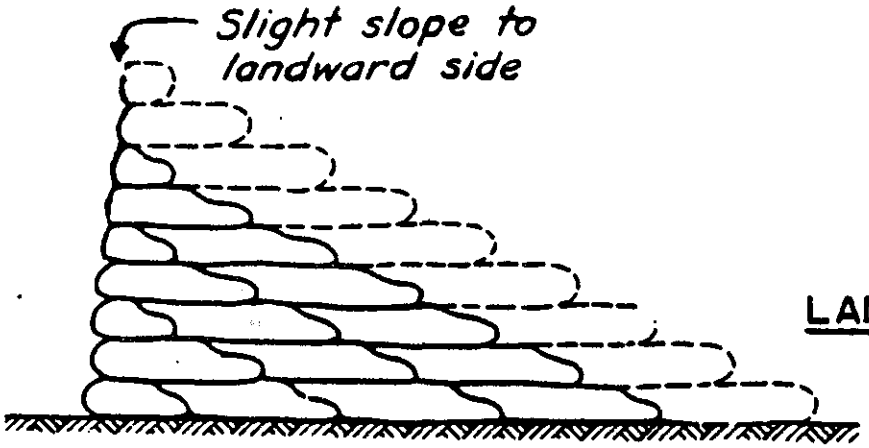
PLAN

Sacks should be laid shingle fashion and not moulded into place

SACKING SLOUGHS STANDARD HIGH WATER MAINTENANCE INSTRUCTION

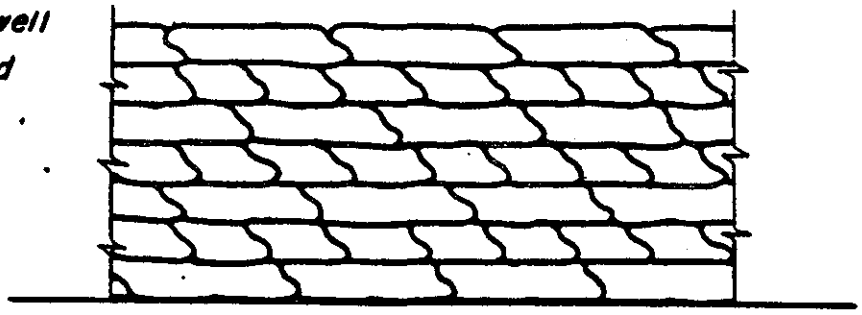
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS

PLATE NO. III



SECTION

Note: Sacks should be lapped at least 1/3 all ways and well mauled or tamped into place.



RIVERSIDE ELEVATION

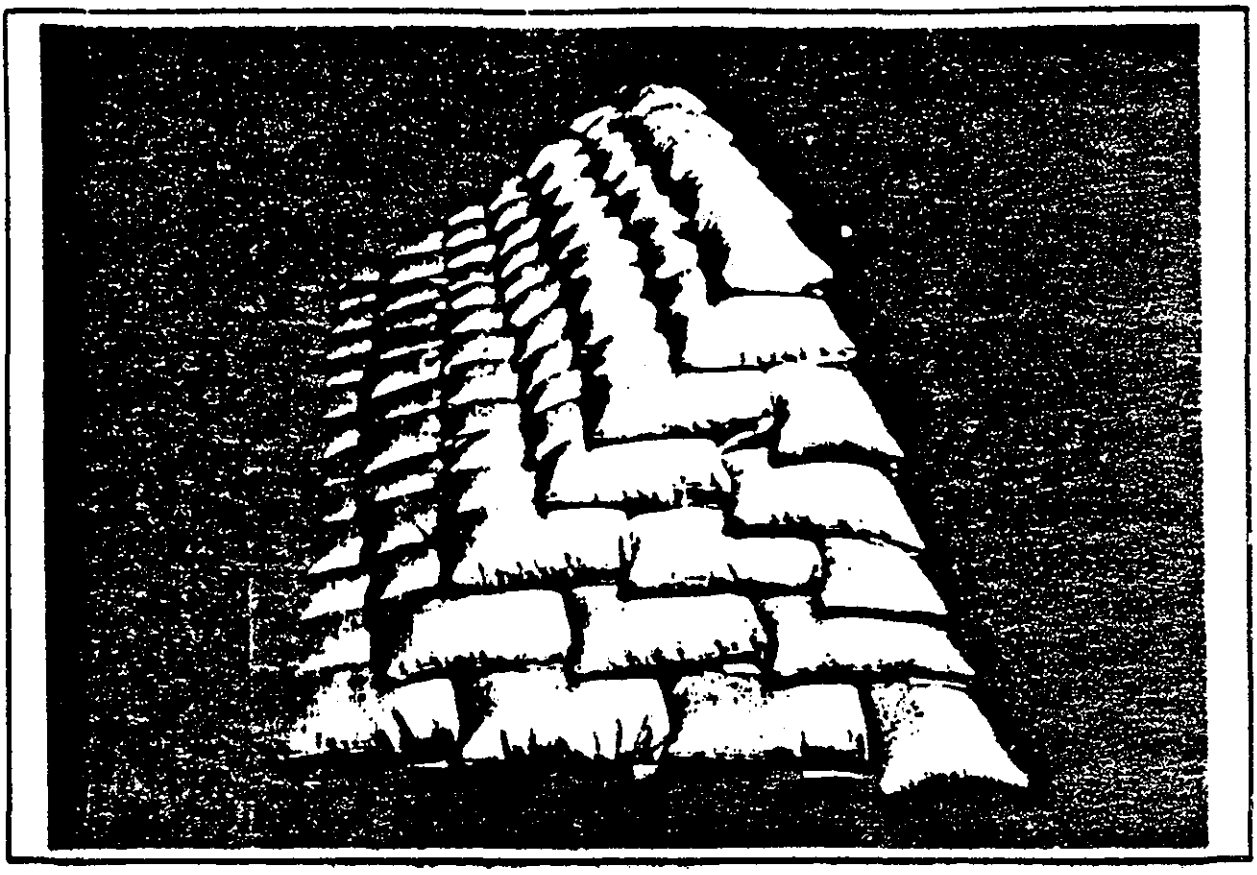
SACKS REQUIRED PER 100' STA.
100 lb. "Feed" Sacks - 1 Cu. Ft. Each

Approx. Hgt. Sack Dike	Sacks High	Required
1.5	3	300
2.0	4	750
3.0	6	1400
4.0	8	2250
5.0	10	3250
6.0	12	4500
7.0	14	5950
8.0	16	7600

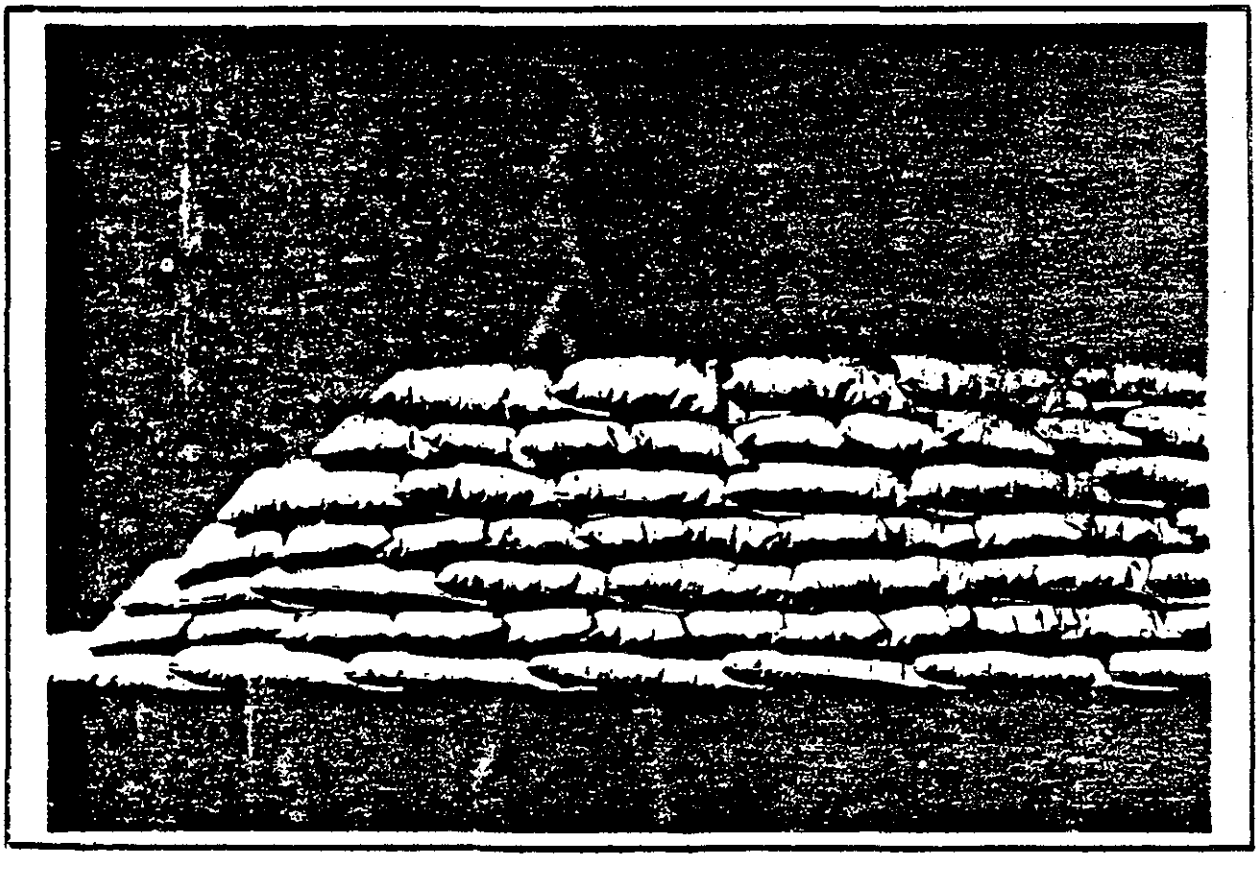
SACK DIKE OR TOPPING STANDARD HIGH WATER MAINTENANCE INSTRUCTION

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

PLATE NO. IV

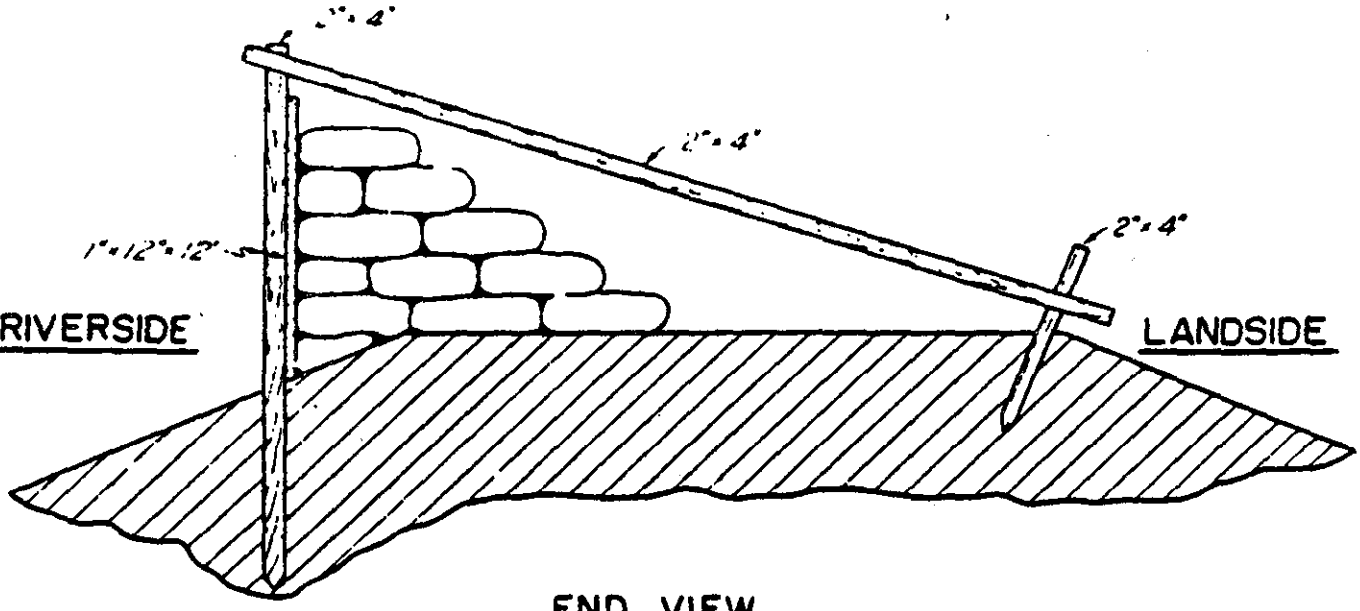


MODEL SACK DIKE OR TOPPING
Typical Section

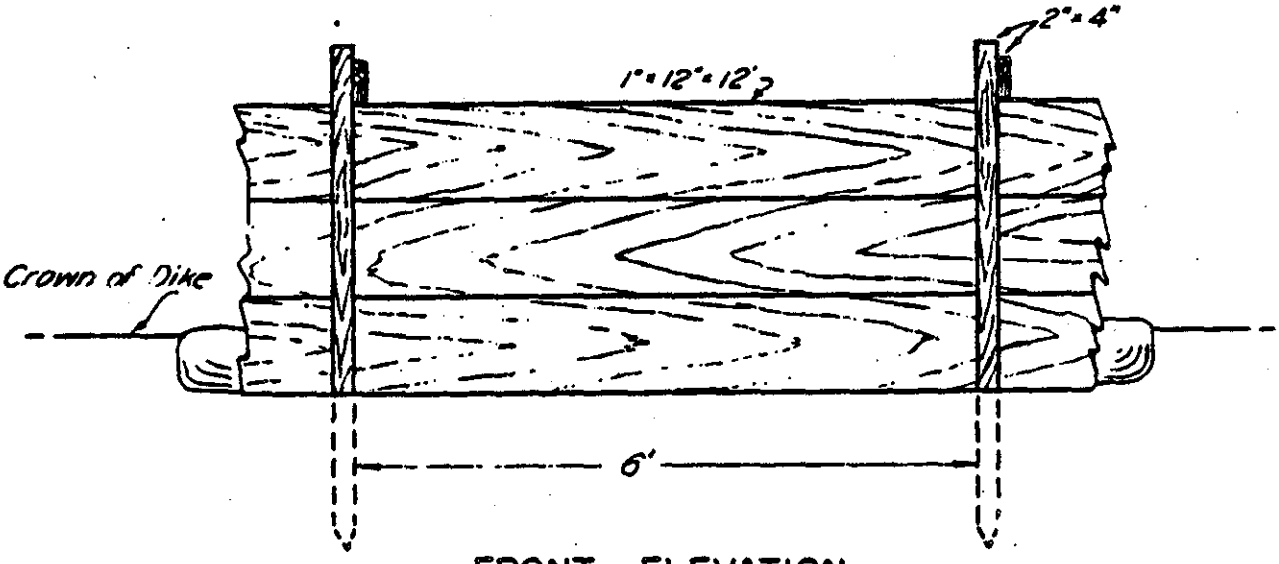


MODEL SACK DIKE OR TOPPING
Riverside View

PLATE NO. V



END VIEW



FRONT ELEVATION

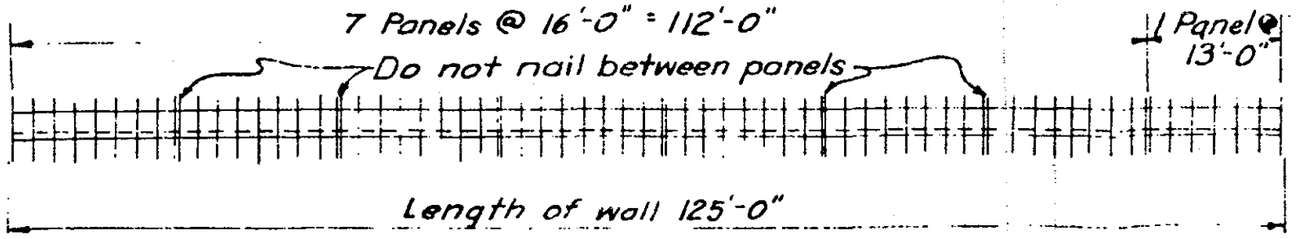
BILL OF MATERIAL TO CONSTRUCT 100 FEET

25 pcs. 1"×12"×12'	17 pcs. 2"×4"×6'
17 pcs. 2"×4"×10'	17 pcs. 2"×4"×2'

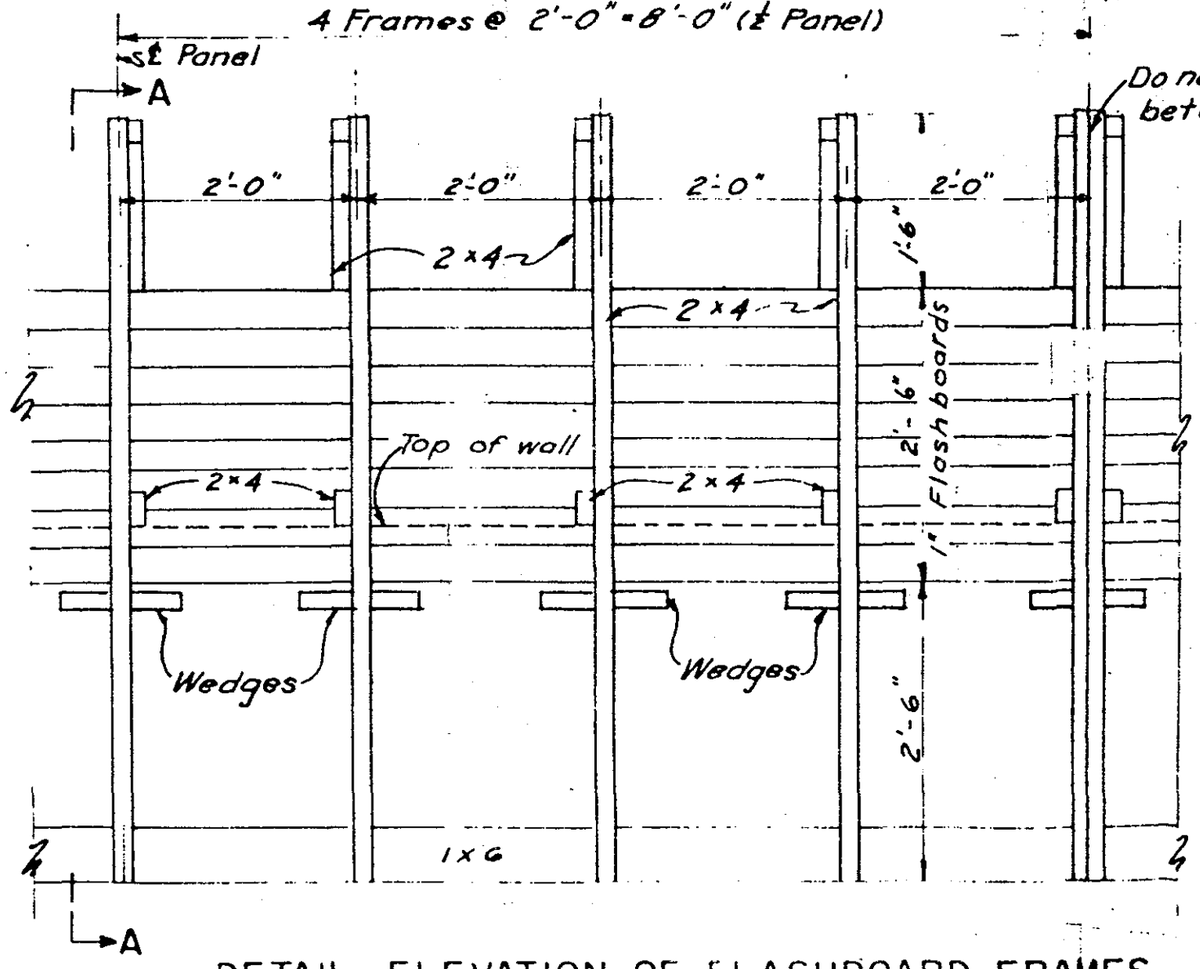
LUMBER AND SACK TOPPING STANDARD HIGH WATER MAINTENANCE INSTRUCTION

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

PLATE NO. VI

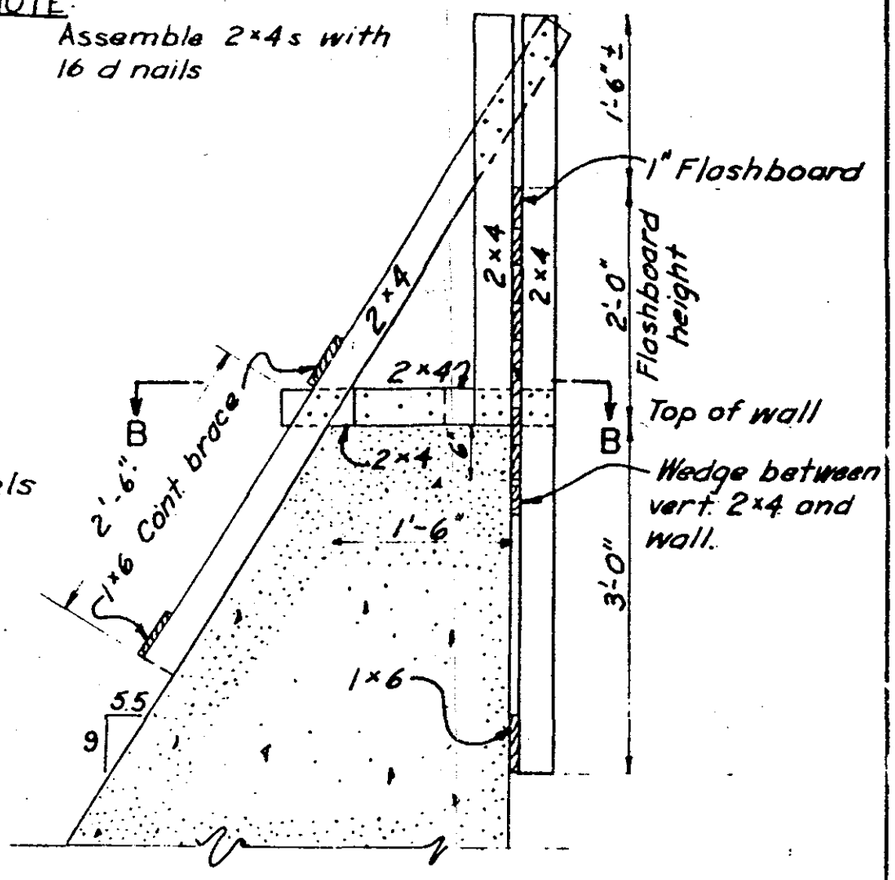


ELEVATION OF FLASHBOARDS
SCALE: 1/16" = 1'-0"

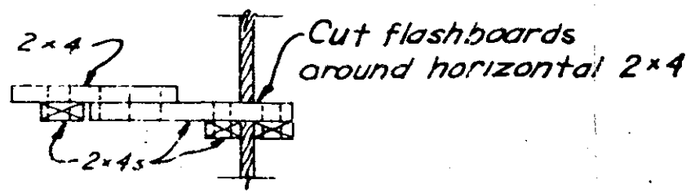


DETAIL ELEVATION OF FLASHBOARD FRAMES
SCALE 3/4" = 1'-0"

NOTE:
Assemble 2×4s with 16 d nails



SECTION A-A
SCALE: 3/4" = 1'-0



SECTION B-B
SCALE 3/4" = 1'-0"

FLOOD EMERGENCY MEASURES

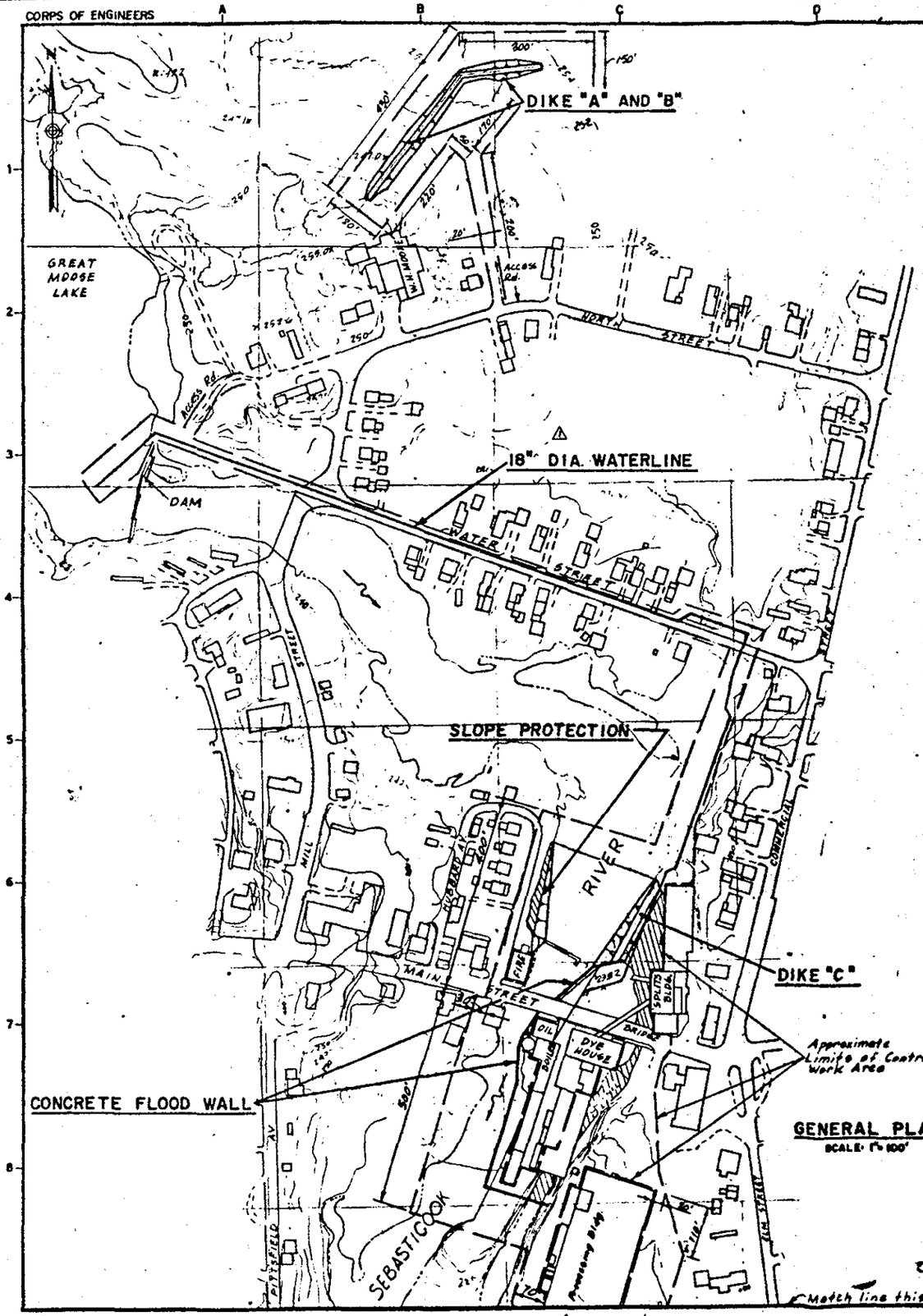
FLASHBOARDS

PLATE NO. VII

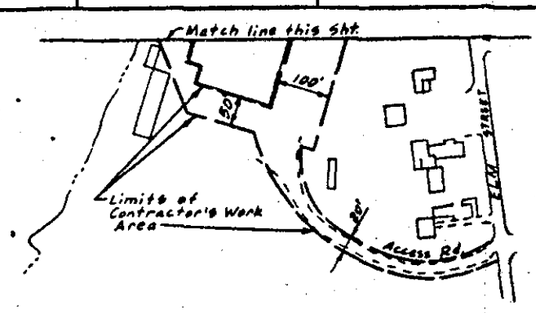
APPENDIX F

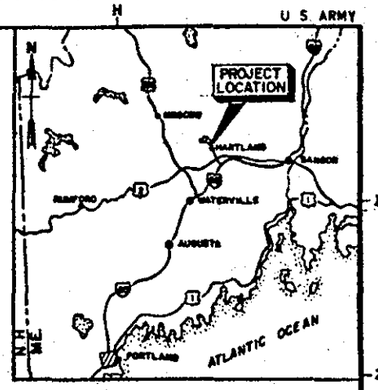
AS-BUILT DRAWINGS

CORPS OF ENGINEERS — U.S. ARMY



GENERAL PLAN
SCALE: 1" = 100'





LOCATION MAP
SCALE: 1" = 20 MI.

INDEX TO DRAWINGS

DRAWING NO.	SHT. NO.	TITLE
HAR-1	1	GENERAL PLAN AND INDEX
	2	ALINEMENT AND CONTROL #1
	3	" " " #2
	4	18" DIA. WATER LINE - PLAN, PROFILE AND SECTIONS
	5	" " " - PLAN AND PROFILE
	6	" " " - PLAN, PROFILE AND SECTION
	7	" " " AND CONC. FLOOD WALL - PLAN AND PROFILES
	8	CONCRETE FLOOD WALL - PLAN, PROFILES, SECTION
	9	" " " - TYPICAL SECTIONS NO. 1
	10	" " " - TYPICAL SECTIONS NO. 2
	11	18" DIA. WATER LINE - MISCELLANEOUS DETAILS
	12	INTERIOR DRAINAGE - PLAN, PROFILE, SECTION AND DETAILS
	13	DIKE "A" AND "B" - PLAN, PROFILES AND SECTIONS
	14	DIKE "C" AND SLOPE PROTECTION - PLAN, PROFILE AND SECTIONS
	15	STOP-LOG STRUCTURE - PLAN, ELEVATIONS, SECTIONS AND DETAILS
	16	TYPICAL FLOOD WALL SECTIONS - REINFORCEMENT DETAILS NO. 1
	17	SPECIAL FLOOD WALL MONOLITHS - REINFORCEMENT DETAILS NO. 2
	18	SPECIAL FLOOD WALL MONOLITHS - REINFORCEMENT DETAILS NO. 3
	19	STRUCTURAL - MISCELLANEOUS DETAILS
	20	INTAKE STRUCTURE & STAFF GAGE, PLAN, STRUCTURES & DETAILS

LEGEND

NEW	EXISTING	DESCRIPTION
	220	CONTOURS
	x240.0	ELEVATIONS
		TREE LINE
		BUILDINGS
		LIMIT OF CONTRACTOR'S WORK AREA
		EARTH FILL
		EARTH FILL WITH STONE SLOPE PROTECTION
		EARTH SURFACE (SECTION)
		APPROX. BEDROCK SURFACE OR ROCK CUT (SECTION)
—SD—	—SD—	STORM DRAIN
D.I.	D.I.	DRAIN INLET
DM		DRAIN MANHOLE
	—SS—	SANITARY SEWER LINE
		SANITARY MANHOLE
GV		GATE VALVE
		HYDRANT
—W—	—W—	WATERLINE
	FP	FOUNDATION PROBE
	FD	FOUNDATION TEST BORING

GENERAL NOTES:

1. Elevations refer to N.G.V. Datum.
2. Unless otherwise indicated on the Plans and Typical Sections, all backfill areas contiguous to the landside of flood walls and Dikes shall be graded to drain.
3. The contractor shall locate, in the field, the alinement of all major features of the work prior to beginning any work. Discrepancies arising due to conflicts in alinement will be brought to the attention of the Contracting Officer's Representative for resolution prior to commencing work.

VALUE ENGINEERING PAYS DIVIDENDS

SAFETY PAYS

GRAPHIC SCALES
1" = 100' — 100' 0 100' 200'

As Built Drawing
Contract No. DACW 33-82-C-0052

3	83 JAN	Final field corrections
2	82 DEC	Waterline and index revised
DETAILS	DATE	DESCRIPTION

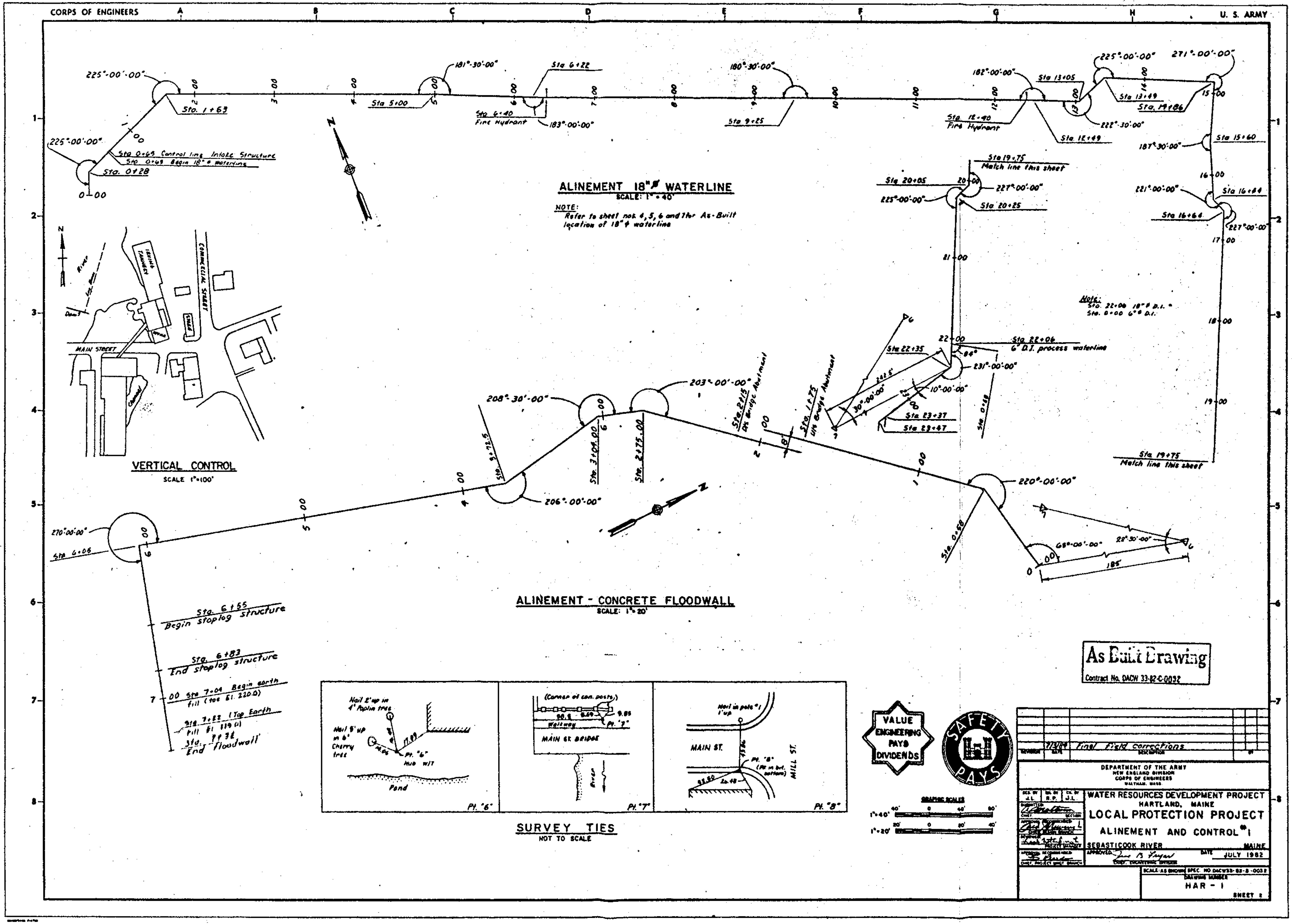
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

WATER RESOURCES DEVELOPMENT PROJECT
HARTLAND, MAINE
LOCAL PROTECTION PROJECT
GENERAL PLAN AND INDEX
SEBASTICOOK RIVER — MAINE

APPROVED: [signature] — DATE: JULY 1982

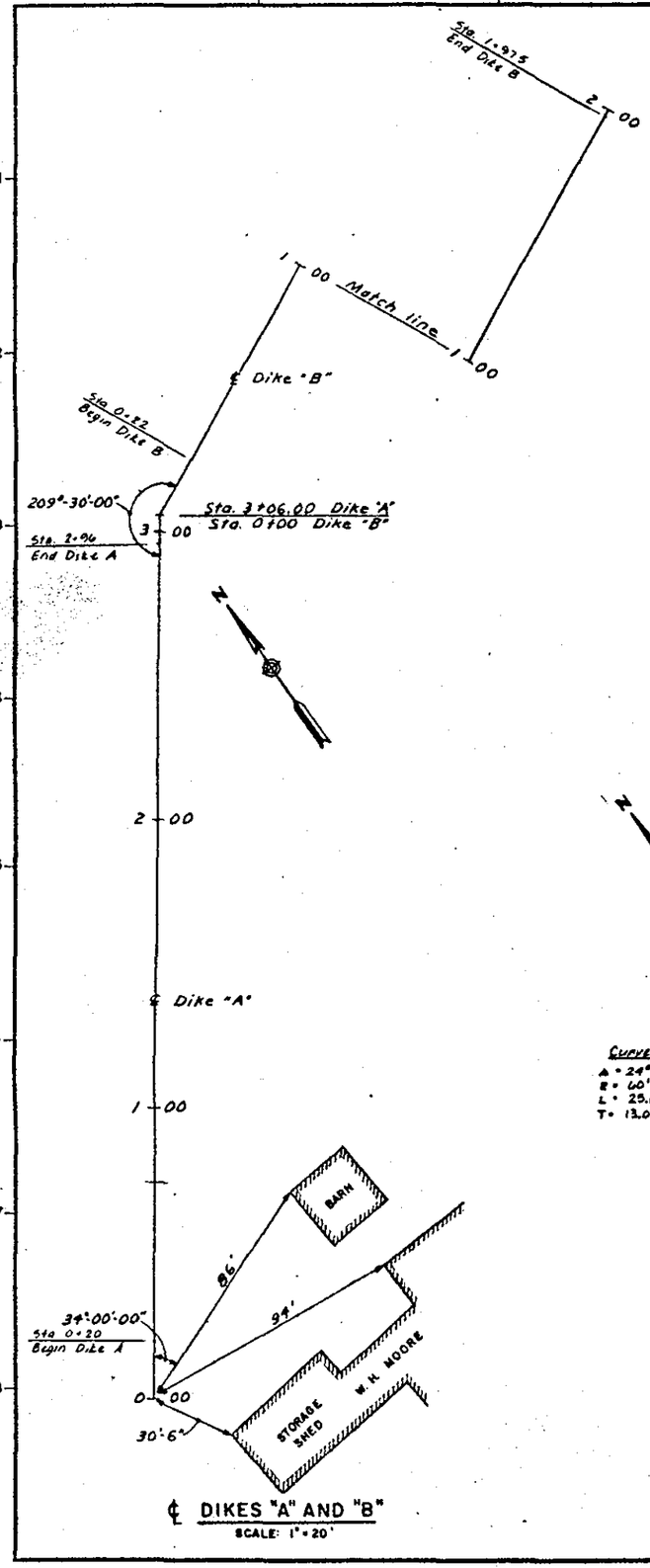
SCALES AS SHOWN — SPEC. NO. DACW33-80-B-0082

DRAWING NUMBER: HAR-1 — SHEET 1



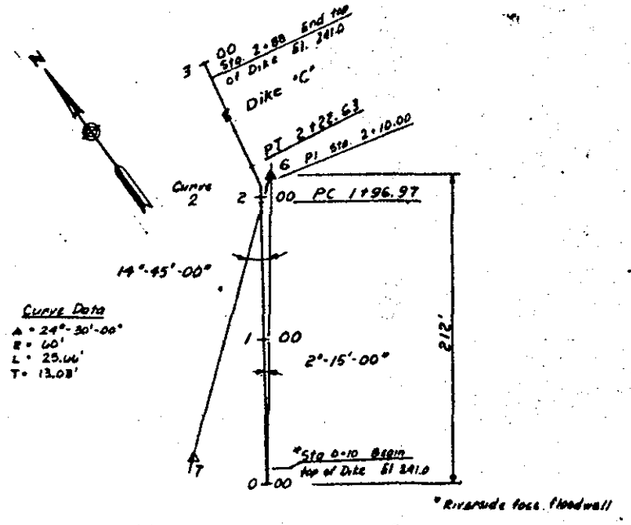
CORPS OF ENGINEERS
U. S. ARMY
ALINEMENT 18" WATERLINE
SCALE: 1" = 40'
NOTE:
Refer to sheet nos. 4, 5, 6 and 7 for As-Built location of 18" waterline
Sta. 0+28
Sta. 1+63
Sta 5+00
Sta 6+22
Sta 6+40 Fire Hydrant
Sta 9+25
Sta 12+40 Fire Hydrant
Sta 12+49
Sta 13+05
Sta 13+49
Sta. 14+86
Sta 15+60
Sta 16+64
Sta 19+75 Match line this sheet
Sta 20+05
Sta 20+25
Sta 22+06 6" D.I. process waterline
Sta 22+35
Sta 23+37
Sta 23+47
VERTICAL CONTROL
SCALE 1" = 100'
MAIN STREET
COMMERCIAL STREET
ALINEMENT - CONCRETE FLOODWALL
SCALE: 1" = 20'
Sta. 6+55 Begin stoplog structure
Sta. 6+83 End stoplog structure
Sta 7+04 Begin earth fill (toe El. 220.0)
Sta. 7+36 End floodwall
SURVEY TIES
NOT TO SCALE
MAIN ST. BRIDGE
MAIN ST.
MILL ST.
Pond
River
Pt. "6"
Pt. "7"
Pt. "8"
As Built Drawing
Contract No. DACW 33-82-C-0032
VALUE ENGINEERING PAYS DIVIDENDS
SAFETY PAYS
Final field corrections
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.
WATER RESOURCES DEVELOPMENT PROJECT
HARTLAND, MAINE
LOCAL PROTECTION PROJECT
ALINEMENT AND CONTROL
SEBASTICOOK RIVER
MAINE
JULY 1982
HAR - 1

CORPS OF ENGINEERS — U. S. ARMY



℄ DIKES "A" AND "B"

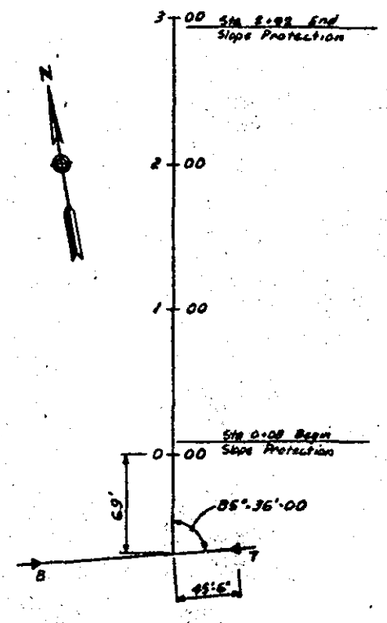
SCALE: 1"=20'



* Riverside face, floodwall

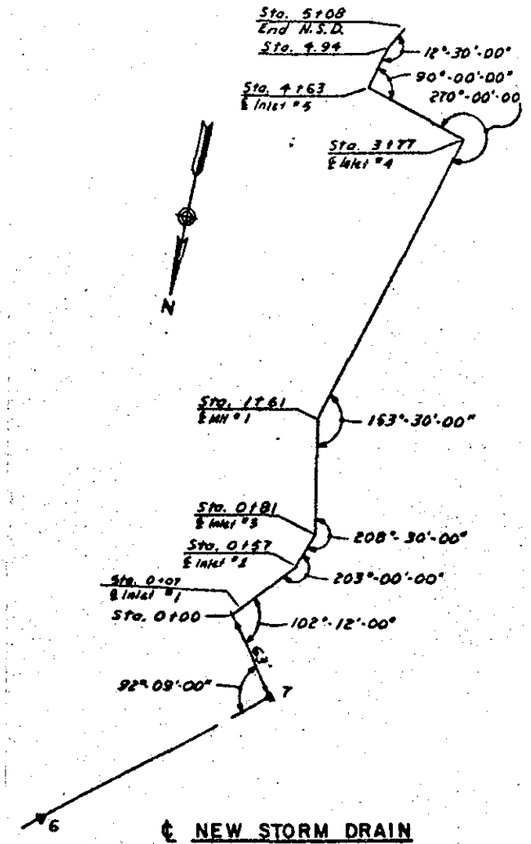
CONTROL LINE DIKE "C"

SCALE: 1"=40'



CONTROL LINE SLOPE PROTECTION

SCALE: 1"=40'



℄ NEW STORM DRAIN

SCALE: 1"=40'

As Built Drawing

Contract No. DACW 33-82-C-0052

VALUE ENGINEERING PAYS DIVIDENDS

SAFETY PAYS

GRAPHIC SCALES

1"=20' 20' 0 20' 40'

1"=40' 40' 0 40' 80'

REVISED	DATE	DESCRIPTION	BY

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

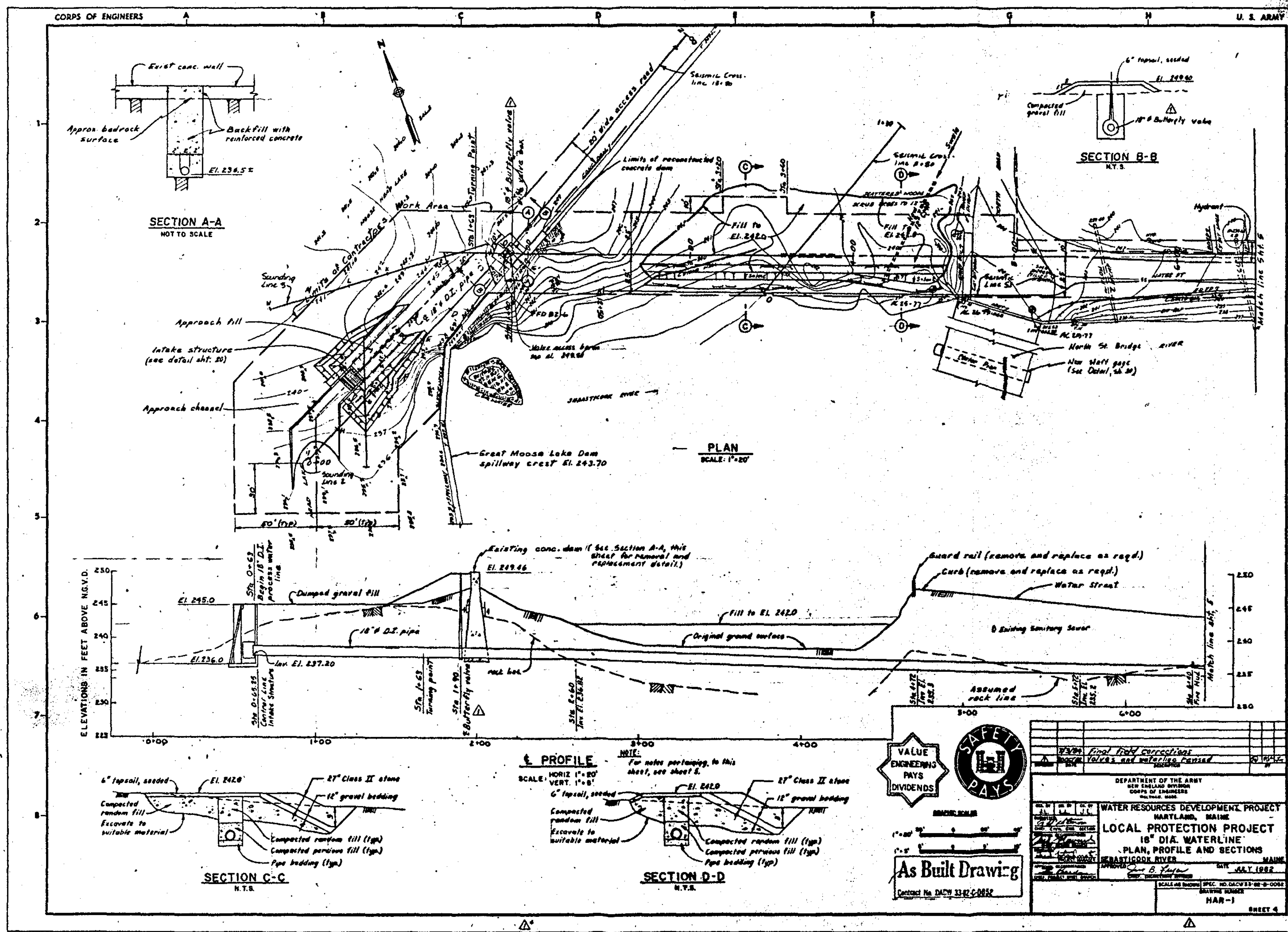
DES. BY JL | DR. BY RF | CK. BY JL

WATER RESOURCES DEVELOPMENT PROJECT
HARTLAND, MAINE
LOCAL PROTECTION PROJECT
ALINEMENT AND CONTROL #2
SEBASTICOOK RIVER MAINE

SUBMITTED — CHIEF, CIVIL ENG. SECTION
RECOMMENDED — CHIEF, ENGINEERING DIVISION
APPROVED — CHIEF, PROJECT MGMT. BRANCH
APPROVED AND RECOMMENDED — CHIEF, ENGINEERING BRANCH
APPROVED — CHIEF, ENGINEERING DIVISION

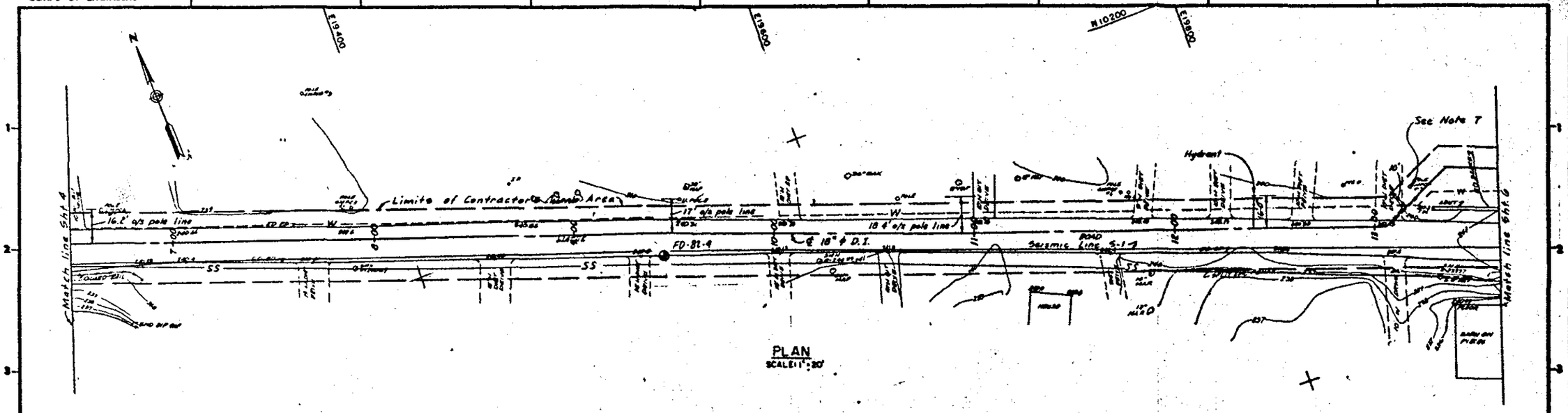
APPROVED Jon B. Fryer — CHIEF, ENGINEERING BRANCH
DATE JULY 1982

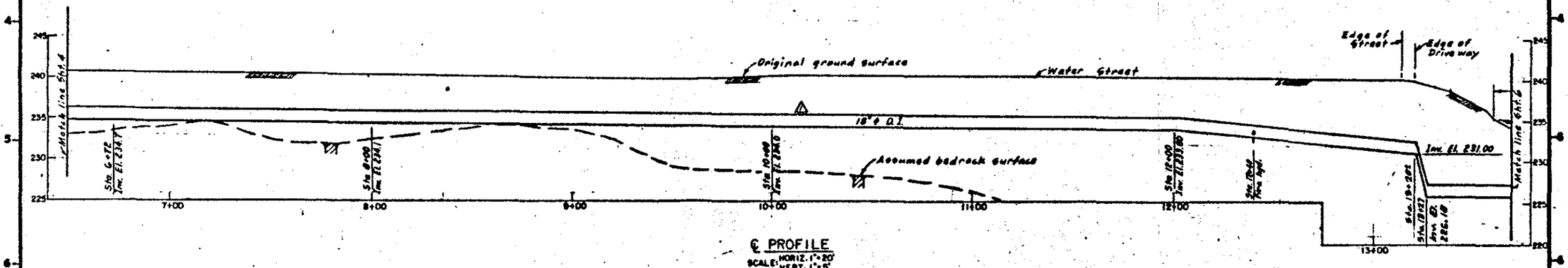
SCALE AS SHOWN | SPEC. NO. DACW 33-82-B-0052
DRAWING NUMBER
HAR-1
SHEET 3



CORPS OF ENGINEERS
U. S. ARMY
Exist conc. wall
Approx. bedrock surface
Backfill with reinforced concrete
El. 236.5±
SECTION A-A
NOT TO SCALE
6" topsoil, seeded
El. 249.40
Compacted gravel fill
18" Ø Butterfly valve
SECTION B-B
N.T.S.
20' wide access road
Seismic Cross-line 18+80
Work Area
Turning Point
18" Ø Butterfly valve
Limits of Contractors Work Area
Limits of reconstructed concrete dam
Seismic Cross-line 8+80
Fill to El. 242.0
Hydrant
Sounding Line 3
Approach fill
Intake structure (see detail sht. 20)
Approach channel
Valve access berm top el. 249.86
North St. Bridge
RIVER
New staff gage (See Detail, sh 20)
SEBASTICOOK RIVER
Great Moose Lake Dam spillway crest El. 243.70
Sounding Line 2
50' (typ)
PLAN
SCALE: 1"=20'
Match line Sht. 5
Existing conc. dam (℄ See Section A-A, this sheet for removal and replacement detail.)
El. 249.46
Guard rail (remove and replace as reqd.)
Curb (remove and replace as reqd.)
Water Street
ELEVATIONS IN FEET ABOVE N.G.V.D.
El. 245.0
Sta. 0+63 Begin 18" D.I. process water line
Dumped gravel fill
Fill to El. 242.0
18" Ø D.I. pipe
Original ground surface
Existing Sanitary Sewer
El. 236.0
Inv. El. 237.20
rock box
Assumed rock line
Sta. 0+55.55 Center Line Intake Structure
Sta. 1+63 Turning point
Sta. 1+90 Butterfly valve
Sta. 2+60 Inv El. 236.88
Match line sht. 5
0+00
1+00
2+00
3+00
4+00
5+00
6+00
℄ PROFILE
SCALE: HORIZ 1"=20' VERT. 1"=8'
NOTE: For notes pertaining to this sheet, see sheet 8.
6" topsoil, seeded
El. 242.0
27" Class II stone
12" gravel bedding
Compacted random fill
Excavate to suitable material
Compacted random fill (typ)
Compacted pervious fill (typ)
Pipe bedding (typ)
SECTION C-C
N.T.S.
SECTION D-D
N.T.S.
VALUE ENGINEERING PAYS DIVIDENDS
SAFETY PAYS
GRAPHIC SCALES
As Built Drawing
Contract No. DACW 33-82-C-0052
Final field corrections
Valves and waterline revised
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.
WATER RESOURCES DEVELOPMENT PROJECT
HARTLAND, MAINE
LOCAL PROTECTION PROJECT
18" DIA. WATERLINE
PLAN, PROFILE AND SECTIONS
SEBASTICOOK RIVER
MAINE
JULY 1982
HAR-1
SHEET 4

CORPS OF ENGINEERS — U. S. ARMY





NOTES:

1. The location, alinement and depth of the existing 10" dia. sanitary sewer is approximate. The contractor shall verify the actual location and depth in the field.
2. The location and depth of the existing 6" dia. C.I. domestic waterline is approximate. The contractor shall verify the actual location and depth in the field.
3. The contractor must exercise caution when working in the area of the sanitary sewer and house laterals, domestic waterline and service connections to avoid unnecessary and excessive interruptions of service.
4. As indicated, the new 18" dia. waterline shall be ductile iron with bell and spigot type joints. The contractor shall furnish all necessary fittings, adapters and special connections required to properly assemble and install the line.
5. For fire hydrant installation details see sheet 11.
6. Locations shown for new fire hydrants are approximate. The contractor shall make necessary adjustment in the field to avoid or minimize interference with the existing 10" dia. sanitary sewer, sewer laterals, domestic water service connections, sidewalks and driveways.
7. The contractor shall coordinate with the Central Maine Power Co. for the temporary relocation of existing power poles, where req'd, during construction of the 18" dia. waterline.
8. For typical sections for the 18" dia. waterline see sheet 11.

As Built Drawing
Contract No. DACW 33-82-C-0052

VALUE ENGINEERING PAYS DIVIDENDS

SAFETY PAYS

DRAWING SCALES
1"=20' 20' 0 20' 40'
1"=5' 5' 0 5' 10'

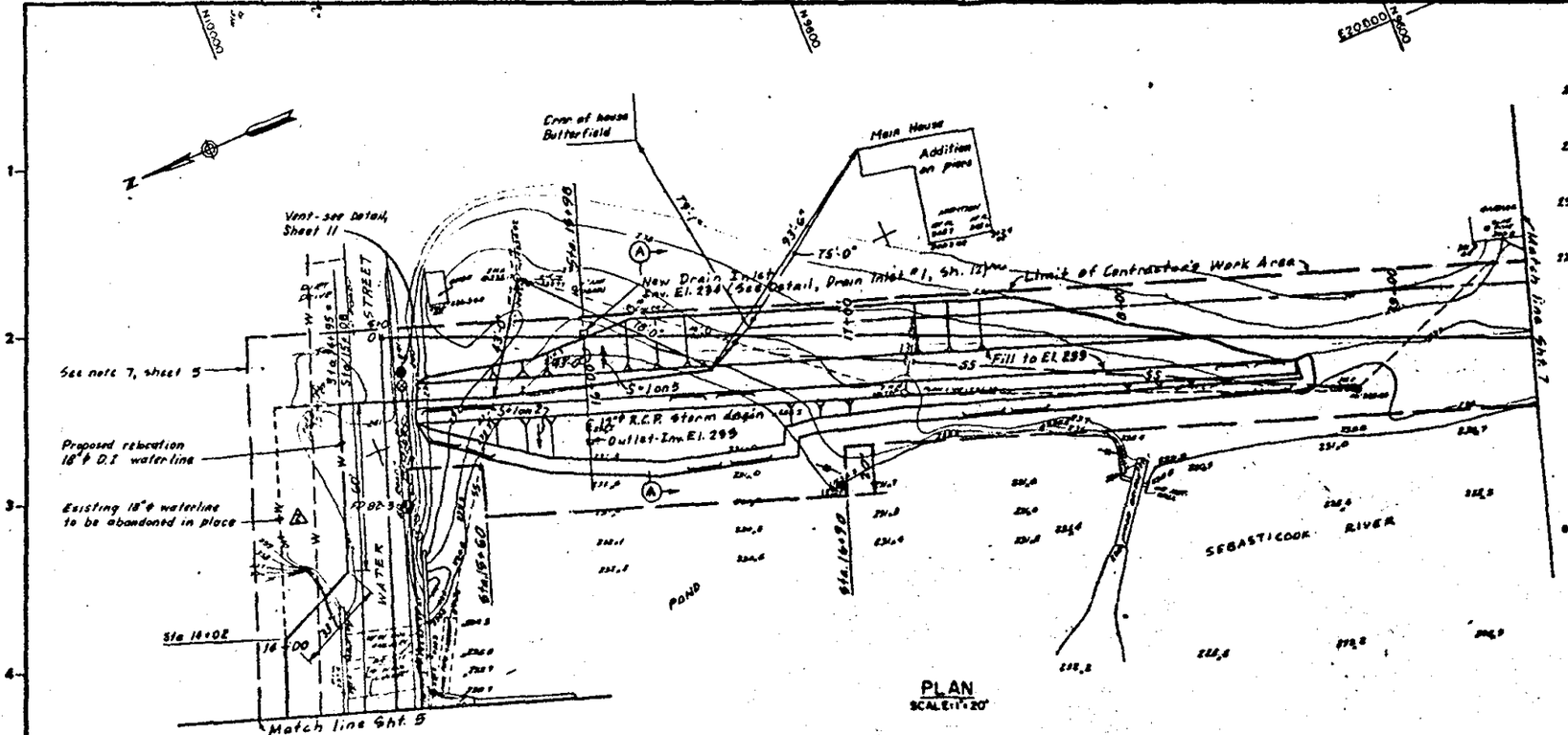
11/4/82	Final field corrections	
10/27/82	Note and waterline revised	

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

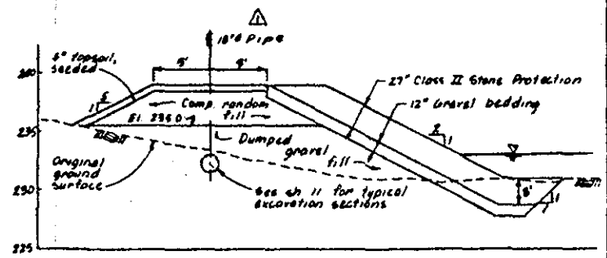
WATER RESOURCES DEVELOPMENT PROJECT
HARTLAND, MAINE
LOCAL PROTECTION PROJECT
18" DIA. WATERLINE
PLAN AND PROFILE
SEBASTICOOK RIVER MAINE
APPROVED: Jim B Payne
DATE: JULY 1982
CHIEF, ENGINEERING DIVISION

SCALE AS SHOWN SPEC. NO. DACW 33-82-C-0052
DRAWING NUMBER
HAR-1
SHEET 9

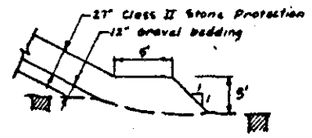
CORPS OF ENGINEERS — U. S. ARMY



PLAN
SCALE: 1" = 20'

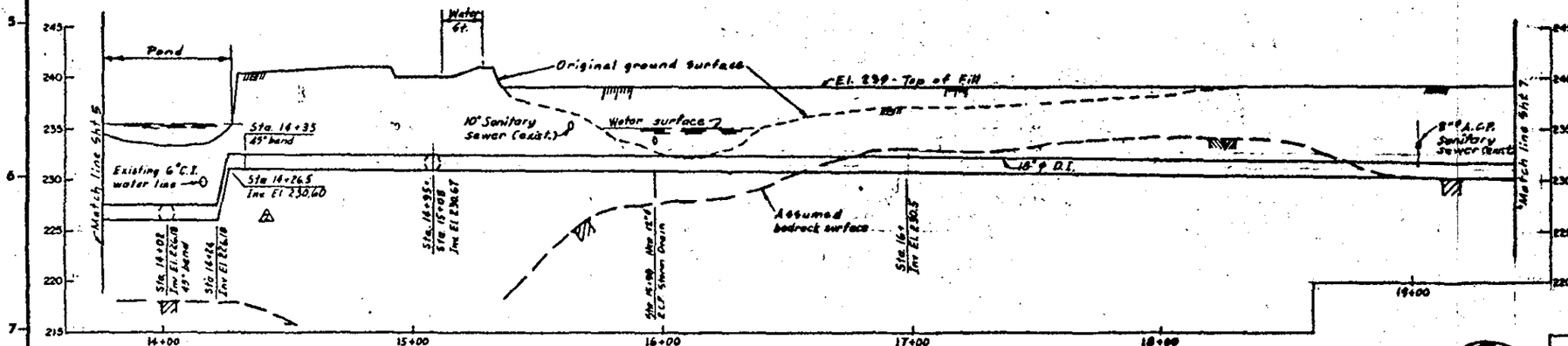


TOE ON EARTH



ALTERNATE TOE DETAIL ON BEDROCK

SECTION A-A
SCALE: 1" = 5'



℄ PROFILE
SCALE: HORIZ. 1"=20'
VERT. 1"=5'

NOTE:
For notes pertaining to this sheet, see sheet 5.

VALUE ENGINEERING PAYS DIVIDENDS

SAFETY PAYS

DRAFTING SCALES

1"=20' 0 20' 40'
1"=10' 0 10' 20'
1"=5' 0 5' 10'

As Built Drawing
Contract No. DACW 33-82-C-0052

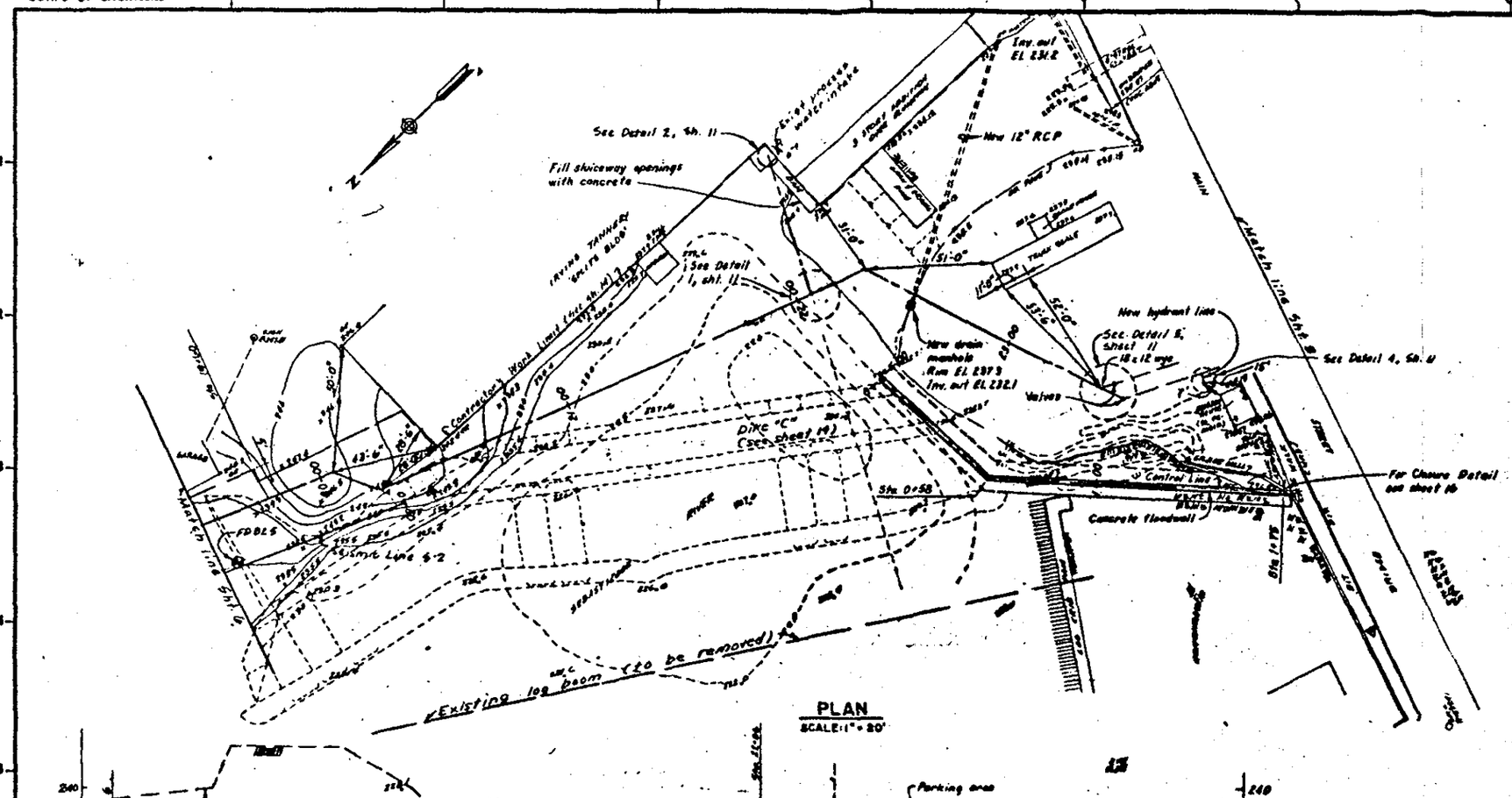
NO.	DATE	DESCRIPTION	BY
3	11/3/89	Final field corrections	
2	10/24/84	Water line revised	
1	10/2/84	Waterline and detail revised	

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

WATER RESOURCES DEVELOPMENT PROJECT
HARTLAND, MAINE
LOCAL PROTECTION PROJECT
18" DIA. WATERLINE
PLAN, PROFILE AND SECTION
SEBASTICOOK RIVER — MAINE

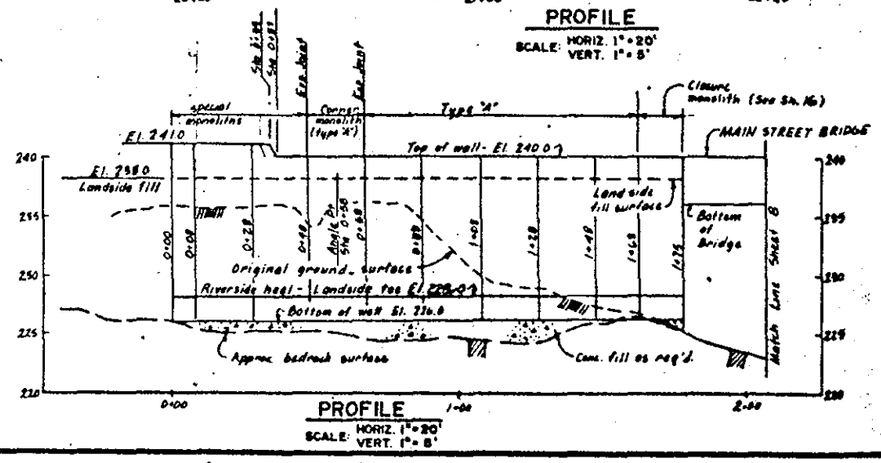
DESIGNED — DATE JULY 1982
SCALE AS SHOWN — SPEC. NO. DACW 33-82-C-0052
DRAWING NUMBER HAR-1
SHEET 6

CORPS OF ENGINEERS — U. S. ARMY



PLAN
SCALE: 1" = 20'

PROFILE
SCALE: HORIZ. 1" = 20'
VERT. 1" = 5'



PROFILE
SCALE: HORIZ. 1" = 20'
VERT. 1" = 5'

As Built Drawing

Contract No. DACW 33-82-C-0032

Note:
1. For notes pertaining to floodwall see sheet 8.
2. For notes pertaining to 18"ϕ waterline see sheet 6
3. For cross-section of floodwall see sheet 9

VALUE ENGINEERING PAYS DIVIDENDS

SAFETY PAYS

7/3/84	Final field corrections		
10/22/82	Waterline revised		
DATE	DESCRIPTION		

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

WATER RESOURCES DEVELOPMENT PROJECT
HARTLAND, MAINE
LOCAL PROTECTION PROJECT
18" DIA. WATER LINE & CONC. FLOOD WALL
PLAN AND PROFILES
SEBASTICOOK RIVER — MAINE

APPROVED: Jane B. Taylor — DATE: JULY 1982

SCALE AS SHOWN — SPEC. NO. DACW 33-82-B-0088

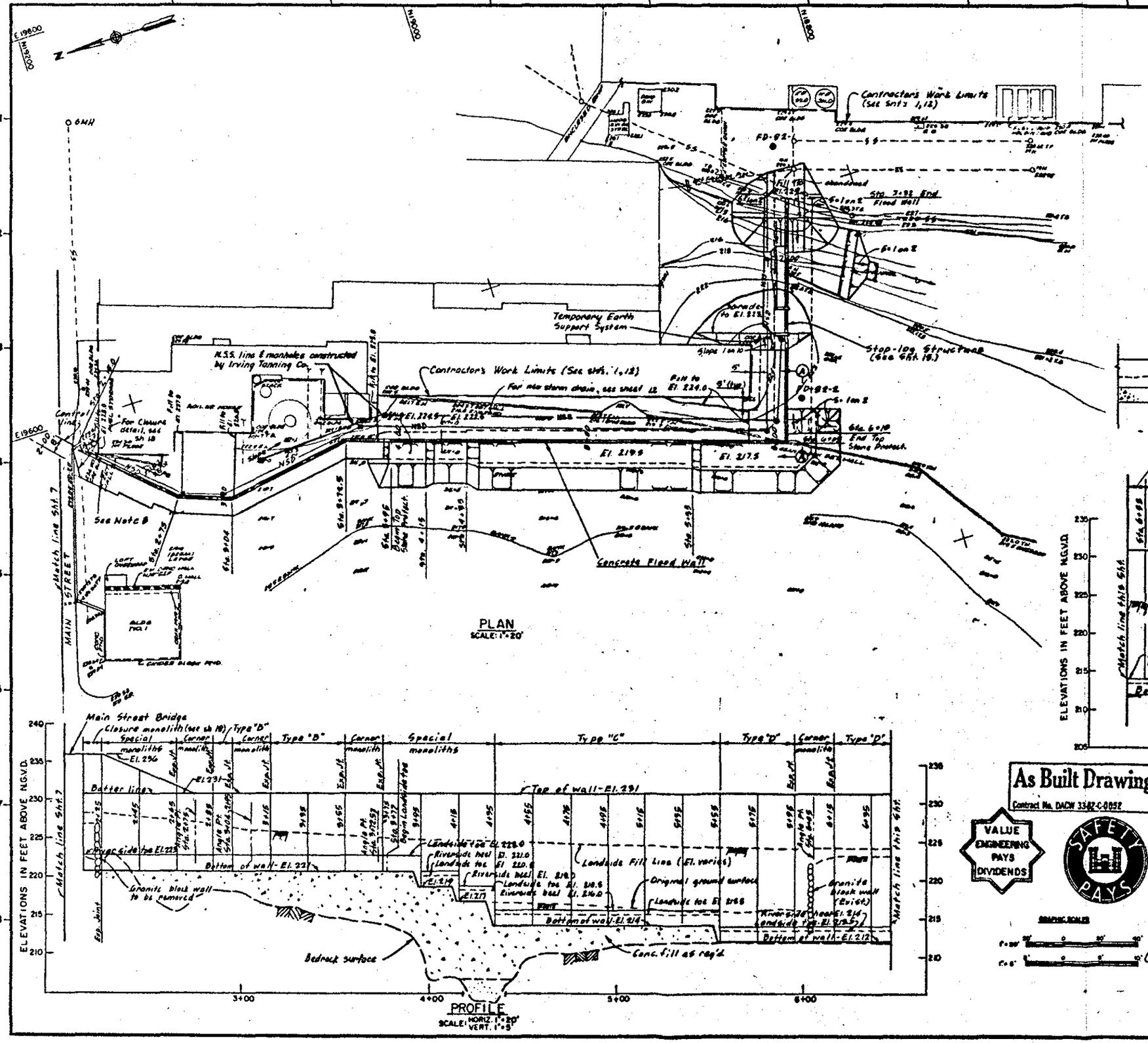
DRAWING NUMBER: HAR-1

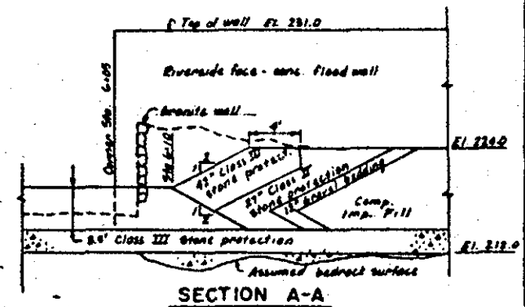
SHEET 7

CORPS OF ENGINEERS — U. S. ARMY

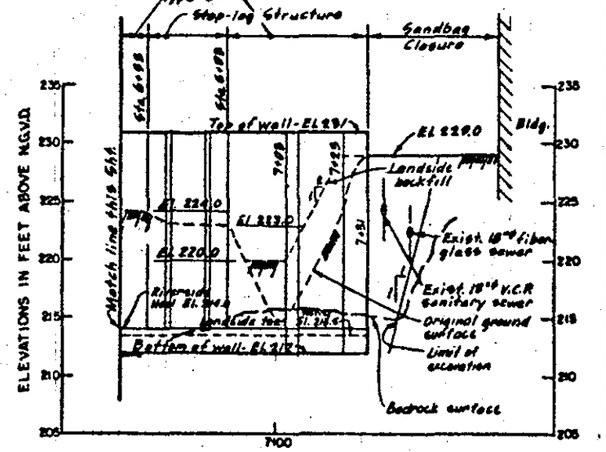
NOTES:

1. All monoliths are 20 ft. long unless otherwise noted.
2. All vertical joints are contraction joints unless otherwise noted as expansion joints. (Exp. Jt.)
3. Special rock excavation required between Flood wall Sta. 2+18 to Sta 2+60, "See specifications."





SECTION A-A
N.T.S.



As Built Drawing
Contract No. DACW 33-82-C-0052

VALUE ENGINEERING PAYS DIVIDENDS

SAFETY PAYS

GRAPHIC SCALES

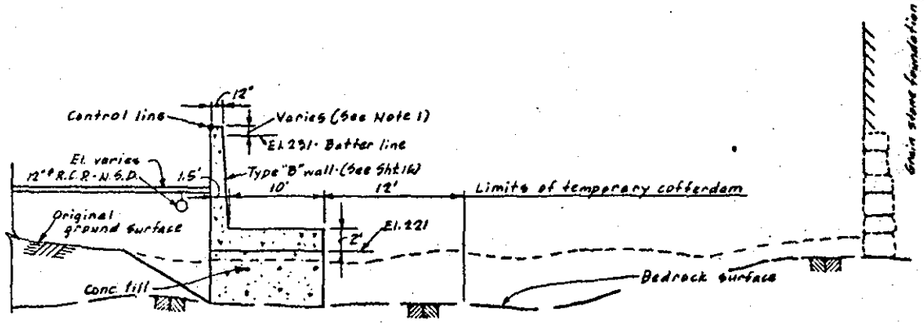
NO.	DATE	DESCRIPTION	BY
1	7/13/84	Final field corrections.	

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

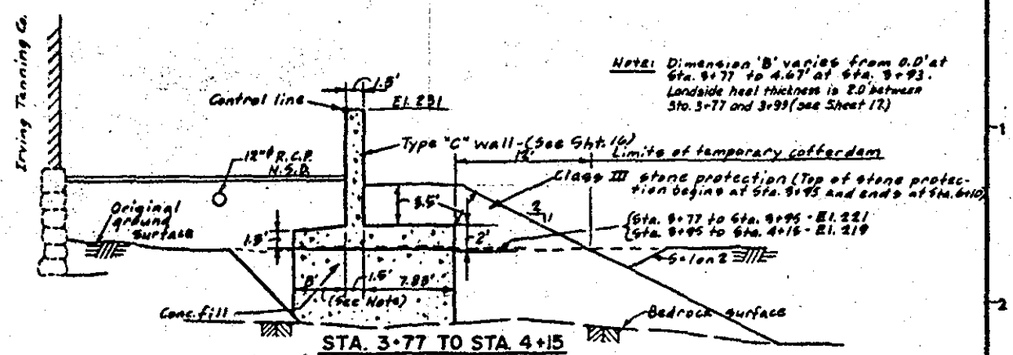
WATER RESOURCES DEVELOPMENT PROJECT
HARTLAND, MAINE
LOCAL PROTECTION PROJECT
CONCRETE FLOOD WALL
PLAN, PROFILES AND SECTION
SEBASTICOOK RIVER — MAINE

DES. BY J.L. | DR. BY L.L. | CHK. BY J.L.
CIVIL DES. SECTION CHIEF
PROJECT MANAGER
APPROVED Jane B. Taylor — DATE JULY 1982
CHIEF, ENGINEERING DIVISION

SCALE AS SHOWN | SPEC. NO. DACW33-82-B-0088
DRAWING NUMBER
HAR-1
SHEET 8



STA. 2+45 TO STA. 2+65

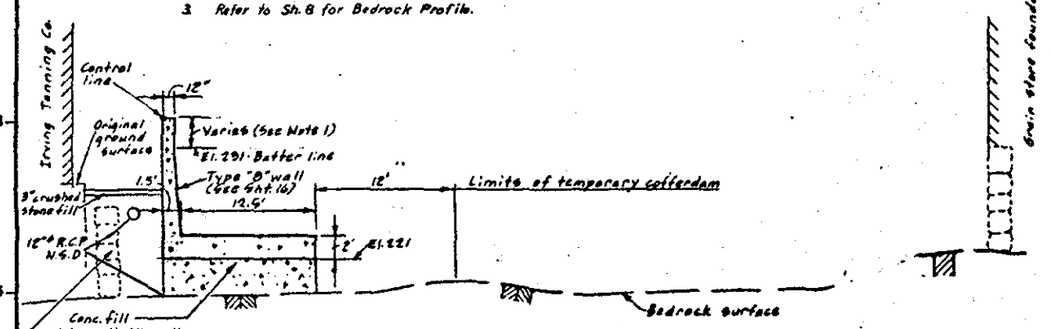


Note: Dimension 'B' varies from 0.0' at Sta. 3+77 to 4.67' at Sta. 3+93. Landside heel thickness is 2.0' between Sta. 3+77 and 3+93 (see Sheet 12)

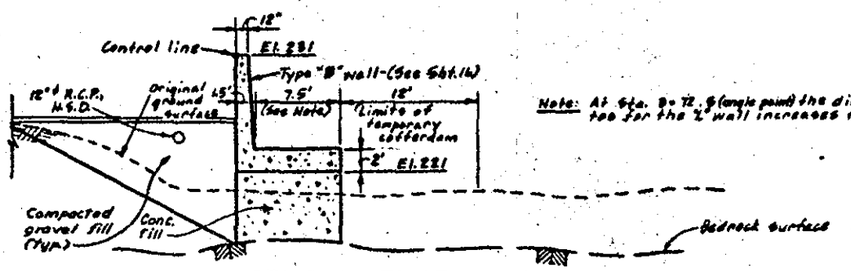
STA. 3+77 TO STA. 4+15

Notes:

1. From Sta. 2+15 to Sta. 2+25 the top of the Flood wall is at El. 296. Between Sta. 2+25 and Sta. 2+75 the El. of the top of the Flood wall varies from 296 to 291.
2. For Detail as to depth, spacing and dimensions of Anchor Bars see Shts. 16 and 17.
3. Refer to Sh. 8 for Bedrock Profile.



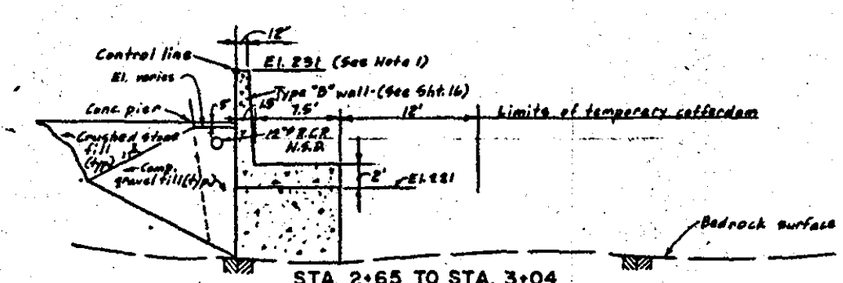
STA. 2+15 TO STA. 2+45



Note: At Sta. 3+72.9 (angle point) the dimension of the toe for the 2' wall increases to 7.89'

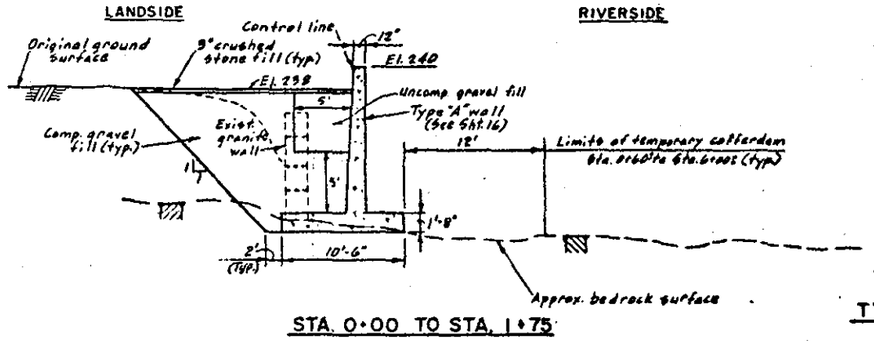
STA. 3+04 TO STA. 3+77

LANDSIDE RIVERSIDE



STA. 2+65 TO STA. 3+04

LANDSIDE RIVERSIDE



STA. 0+00 TO STA. 1+75

TYPICAL SECTIONS
SCALE: 1" = 8'

As Built Drawing
Contract No. DACW 33-82-C-0052

VALUE ENGINEERING PAYS DIVIDENDS

SAFETY PAYS

DRAWING SCALE
1"=8' 0 8' 16'

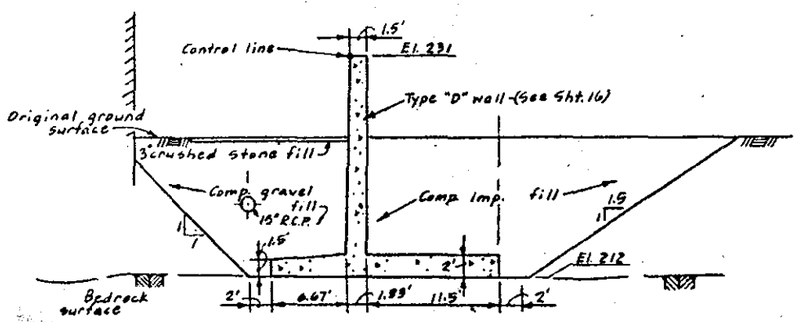
1	7/30/84	Final field corrections.	
NO.	DATE	DESCRIPTION	BY

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DESIGNED J.L. | DRAWN J.L. | CHECKED J.L.

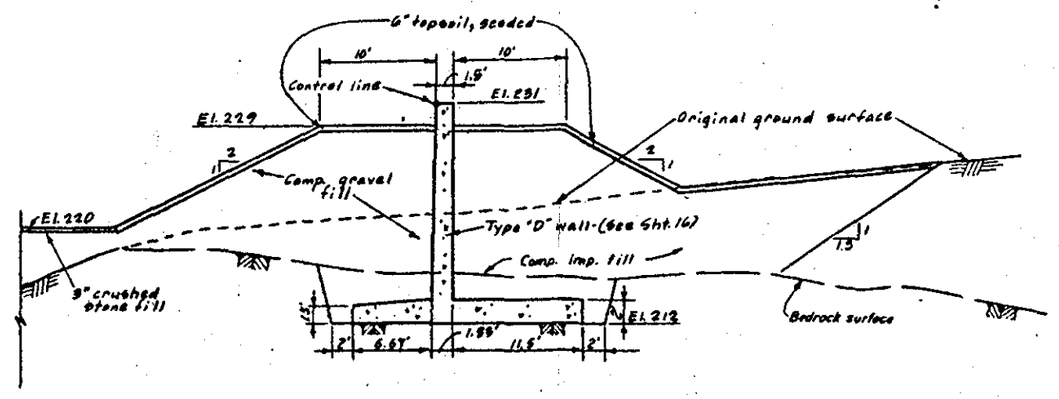
WATER RESOURCES DEVELOPMENT PROJECT
HARTLAND, MAINE
LOCAL PROTECTION PROJECT
CONCRETE FLOOD WALL
TYPICAL SECTIONS NO. 1
SEBASTICOOK RIVER MAINE
APPROVED Lee B. Fryar CHIEF, ENGINEERING DIVISION DATE JULY 1982

SCALE AS SHOWN | SPEC. NO. DACW 33-82-B-0052
DRAWING NUMBER
HAR-1
SHEET 9

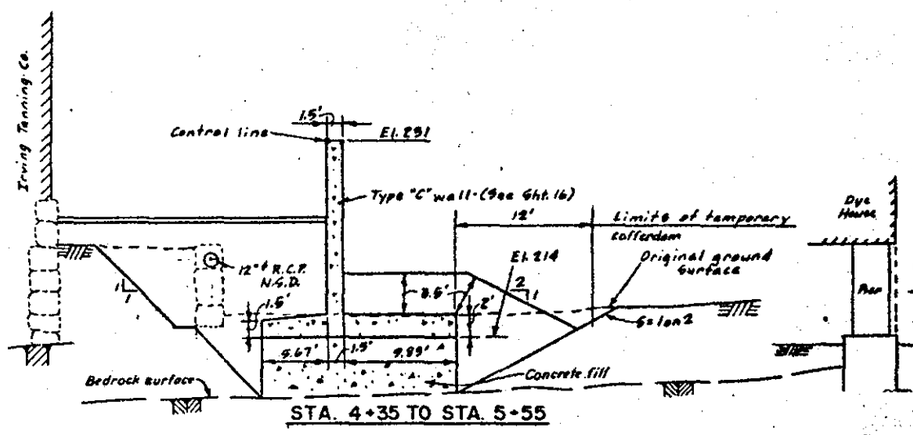


Note: Sta. 6+55 to Sta. 6+83. Stop-log Structure. (See Sht. 16)

STA. 5+55 TO STA. 6+55

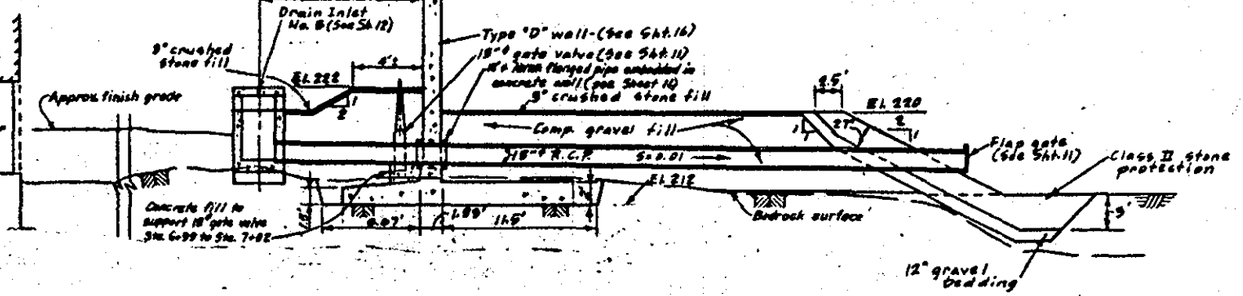


STA. 7+05 TO STA. 7+32



STA. 4+35 TO STA. 5+55

LANDSIDE RIVERSIDE



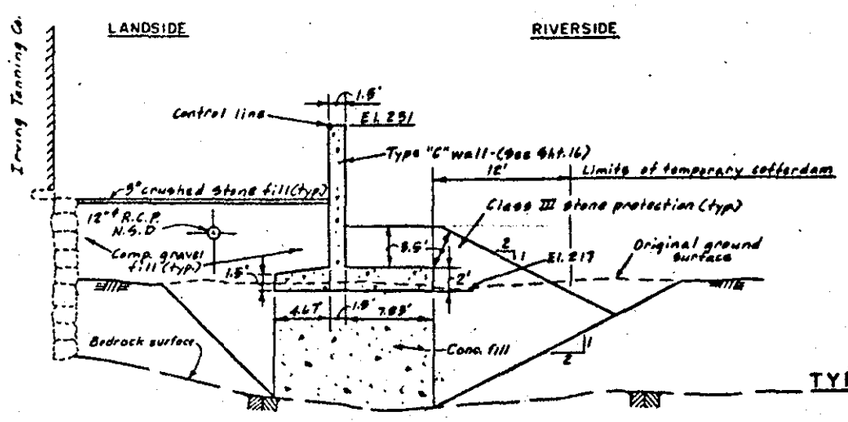
STA. 6+83 TO STA. 7+05

NOTE: 18" RCP storm drains, gate valve, C.I. thimble and inlet apply to Sta. 7+00 only.

NOTE Refer to Sh 8 for Bedrock Profile.

As Built Drawing
Contract No. DACW 33-82-C-0052

LANDSIDE RIVERSIDE



TYPICAL SECTIONS
SCALE: 1"=5'

VALUE ENGINEERING PAYS DIVIDENDS

SAFETY PAYS

GRAPHIC SCALE
1"=5' 0 5' 10'

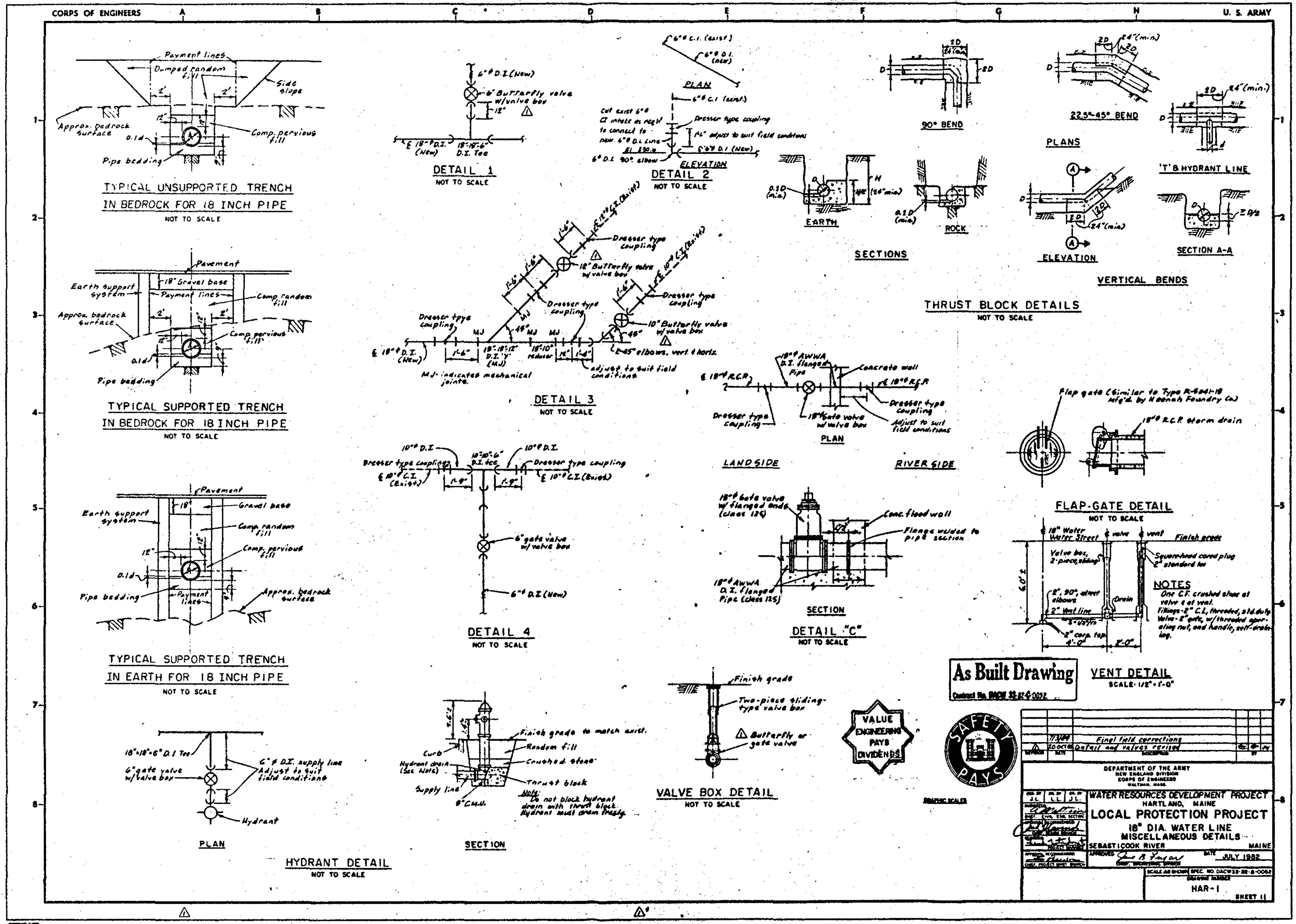
7/28/82	Final field corrections		
DATE	DESCRIPTION		BY

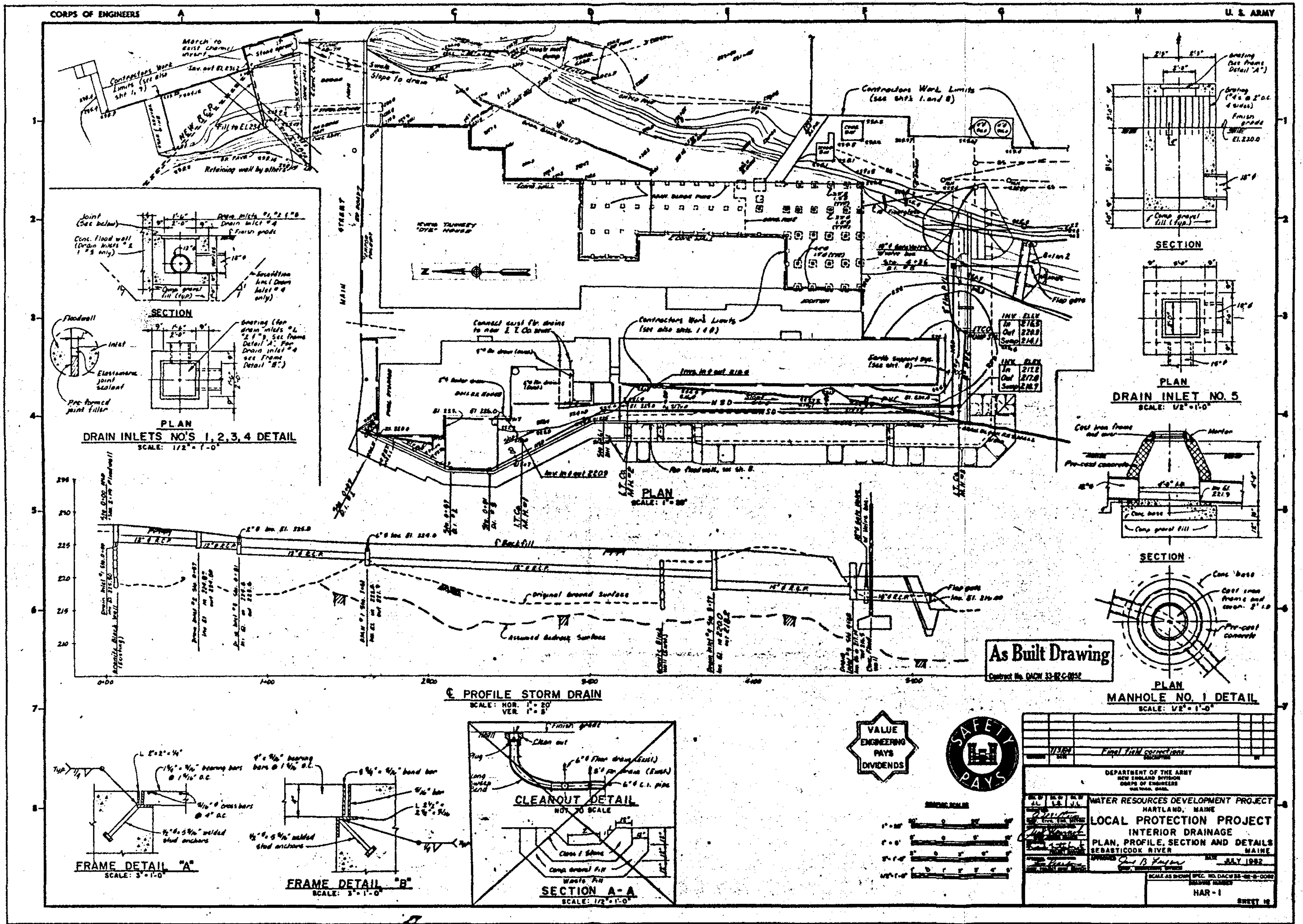
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

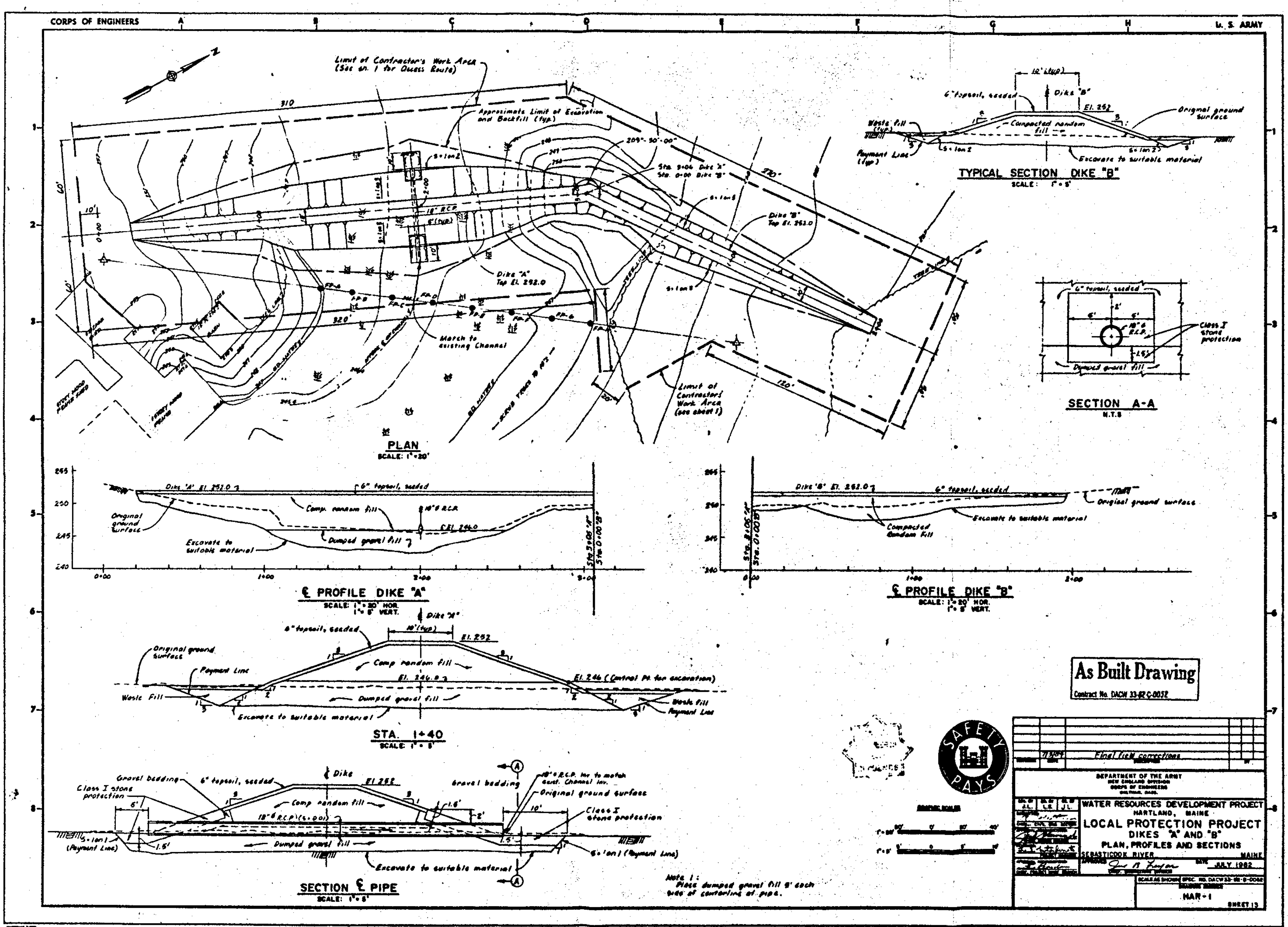
WATER RESOURCES DEVELOPMENT PROJECT
HARTLAND, MAINE
LOCAL PROTECTION PROJECT
CONCRETE FLOOD WALL
TYPICAL SECTIONS NO. 2
SEBASTICOOK RIVER MAINE

APPROVED DATE JULY 1982
CHIEF, ENGINEERING BRANCH

SCALE AS SHOWN SPEC. NO. DACW33-82-B-0052
DRAWING NUMBER HAR-1
SHEET 10

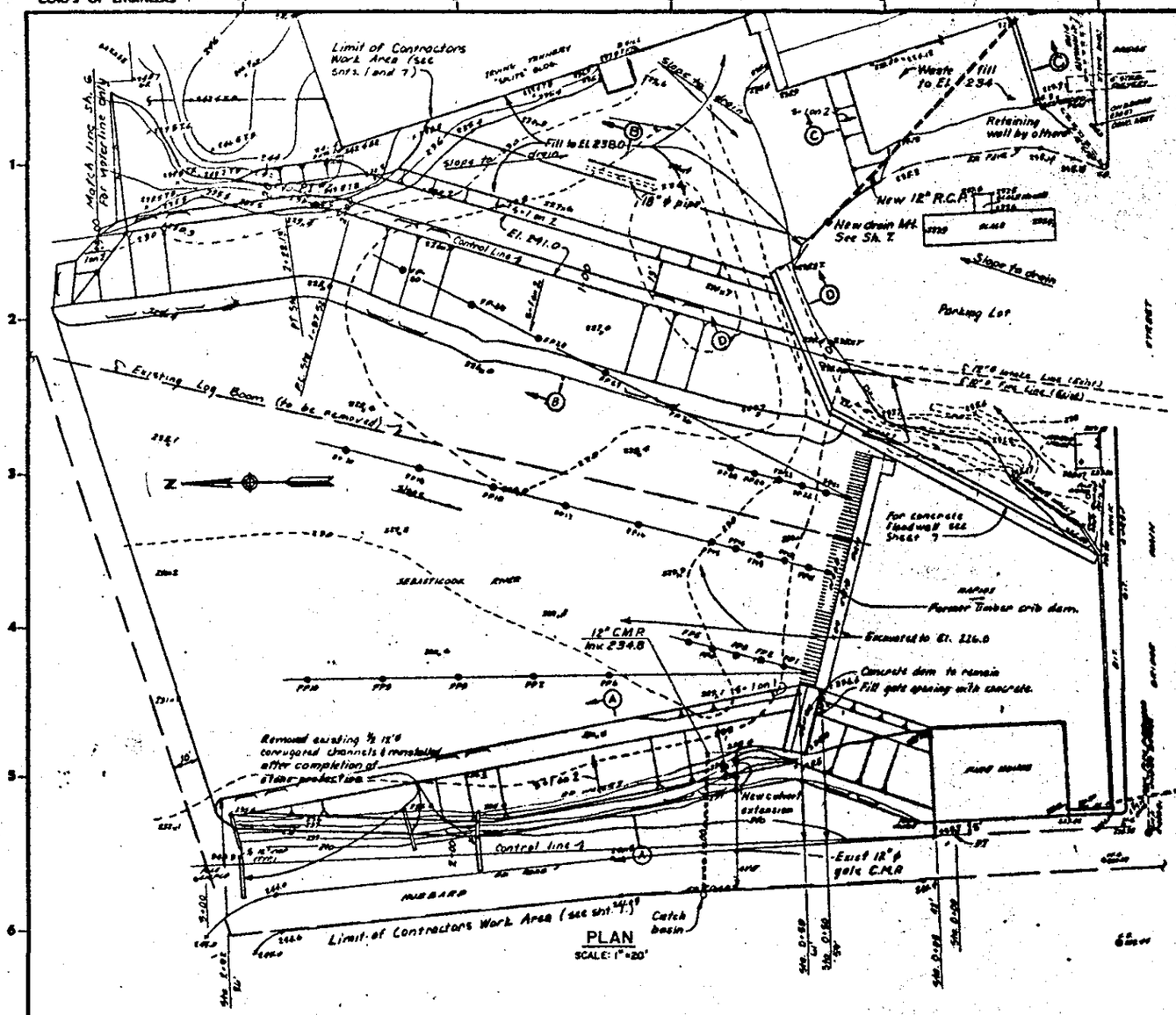

CORPS OF ENGINEERS
U. S. ARMY
TYPICAL UNSUPPORTED TRENCH
IN BEDROCK FOR 18 INCH PIPE
NOT TO SCALE
Payment lines
Dumped random fill
Side slope
Approx. bedrock surface
Comp. pervious fill
Pipe bedding
TYPICAL SUPPORTED TRENCH
IN BEDROCK FOR 18 INCH PIPE
NOT TO SCALE
Pavement
18" Gravel base
Earth support system
Comp. random fill
TYPICAL SUPPORTED TRENCH
IN EARTH FOR 18 INCH PIPE
NOT TO SCALE
DETAIL 1
NOT TO SCALE
6" Butterfly valve w/valve box
DETAIL 2
NOT TO SCALE
PLAN
ELEVATION
Dresser type coupling
DETAIL 3
NOT TO SCALE
12" Butterfly valve w/valve box
10" Butterfly valve w/valve box
MJ - indicates mechanical joints.
DETAIL 4
NOT TO SCALE
6" gate valve w/valve box
90° BEND
22.5°-45° BEND
PLANS
'T' & HYDRANT LINE
EARTH
ROCK
SECTIONS
ELEVATION
SECTION A-A
VERTICAL BENDS
THRUST BLOCK DETAILS
NOT TO SCALE
PLAN
LANDSIDE
RIVERSIDE
SECTION
DETAIL "C"
NOT TO SCALE
Conc. flood wall
FLAP-GATE DETAIL
NOT TO SCALE
18" R.C.P. storm drain
NOTES
VENT DETAIL
SCALE: 1/2" = 1'-0"
PLAN
HYDRANT DETAIL
NOT TO SCALE
SECTION
Hydrant
VALVE BOX DETAIL
NOT TO SCALE
Finish grade
Two-piece sliding-type valve box
Butterfly or gate valve
As Built Drawing
VALUE ENGINEERING PAYS DIVIDENDS
SAFETY PAYS
Final field corrections
Detail and valves revised
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.
WATER RESOURCES DEVELOPMENT PROJECT
HARTLAND, MAINE
LOCAL PROTECTION PROJECT
18" DIA. WATER LINE
MISCELLANEOUS DETAILS
SEBASTICOOK RIVER
MAINE
JULY 1982
HAR-1
SHEET 11


CORPS OF ENGINEERS
U. S. ARMY
Contractors Work Limits (see shts 1 and 8)
Retaining wall by others
Contractors Work Limits (see also shts 1 & 8)
Connect exist flr. drains to new S. T. Co. sewer
Earth support sys. (see sht. 8)
For flood wall, see sh. 8
PLAN
SCALE: 1" = 20'
Flap gate
MAIN STREET
SECTION
PLAN
DRAIN INLETS NO'S 1, 2, 3, 4 DETAIL
SCALE: 1/2" = 1'-0"
SECTION
PLAN
DRAIN INLET NO. 5
SCALE: 1/2" = 1'-0"
SECTION
PLAN
MANHOLE NO. 1 DETAIL
SCALE: 1/2" = 1'-0"
Original Ground Surface
Assumed Bedrock Surface
℄ PROFILE STORM DRAIN
SCALE: HOR. 1" = 20'
VER. 1" = 5'
As Built Drawing
Contract No. DACW 33-82-C-0052
FRAME DETAIL "A"
SCALE: 3" = 1'-0"
FRAME DETAIL "B"
SCALE: 3" = 1'-0"
CLEANOUT DETAIL
NOT TO SCALE
SECTION A-A
SCALE: 1/2" = 1'-0"
VALUE ENGINEERING PAYS DIVIDENDS
SAFETY PAYS
Final field corrections
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WATER RESOURCES DEVELOPMENT PROJECT
HARTLAND, MAINE
LOCAL PROTECTION PROJECT
INTERIOR DRAINAGE
PLAN, PROFILE, SECTION AND DETAILS
SEBASTICOOK RIVER
MAINE
JULY 1982
HAR-1



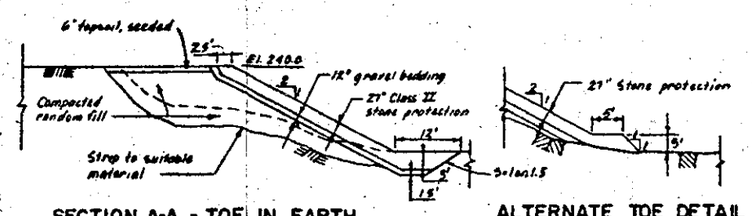
CORPS OF ENGINEERS
U. S. ARMY
Limit of Contractor's Work Area (See sh. 1 for Access Route)
Approximate Limit of Excavation and Backfill (typ.)
Sta. 3+06 Dike "A"
Sta. 0+00 Dike "B"
Dike "B" Top El. 252.0
Dike "A" Top El. 252.0
18" R.C.P.
Match to existing Channel
Limit of Contractors Work Area (see sheet 1)
PLAN
SCALE: 1"=20'
TYPICAL SECTION DIKE "B"
6" topsoil, seeded
Compacted random fill
Original ground surface
Waste fill (typ.)
Payment Line (typ.)
Excavate to suitable material
SECTION A-A
N.T.S.
Class I stone protection
Dumped gravel fill
℄ PROFILE DIKE "A"
SCALE: 1"=20' HOR. 1"=5' VERT.
Dike 'A' El. 252.0
Comp. random fill
Original ground surface
Excavate to suitable material
Dumped gravel fill
℄ PROFILE DIKE "B"
SCALE: 1"=20' HOR. 1"=5' VERT.
Dike 'B' El. 252.0
Compacted Random Fill
STA. 1+40
SCALE: 1"=5'
Comp random fill
El. 246 (Control Pt. for excavation)
Waste Fill
Payment Line
SECTION ℄ PIPE
SCALE: 1"=5'
Gravel bedding
Class I stone protection
18" R.C.P. Inv. to match exist. Channel inv.
Original ground surface
Excavate to suitable material
Note 1: Place dumped gravel fill 5' each side of centerline of pipe.
As Built Drawing
Contract No. DACW 33-82-C-0052
Final field corrections
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WATER RESOURCES DEVELOPMENT PROJECT
HARTLAND, MAINE
LOCAL PROTECTION PROJECT
DIKES "A" AND "B"
PLAN, PROFILES AND SECTIONS
SEBASTICOOK RIVER MAINE
JULY 1982
HAR-1
SHEET 13

CORPS OF ENGINEERS — U. S. ARMY



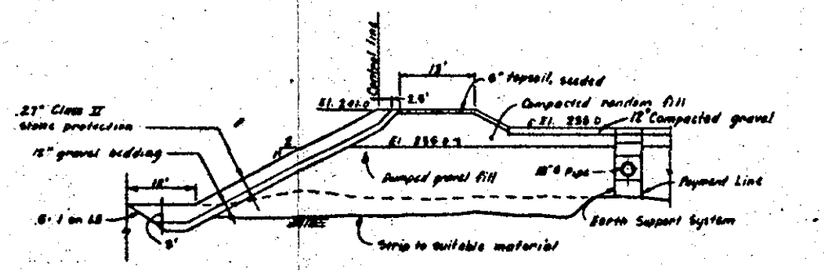
PLAN
SCALE: 1" = 20'

℄ PROFILE DIKE "C"
SCALE: 1" = 20' HOR.
1" = 5' VER.



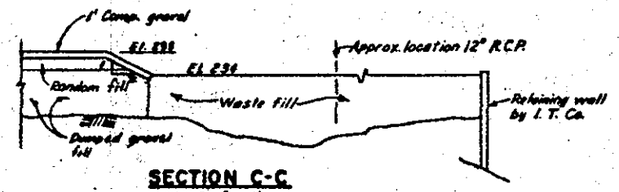
SECTION A-A - TOE IN EARTH
SCALE: 1" = 10'

ALTERNATE TOE DETAIL ON BEDROCK
SCALE: 1" = 10'

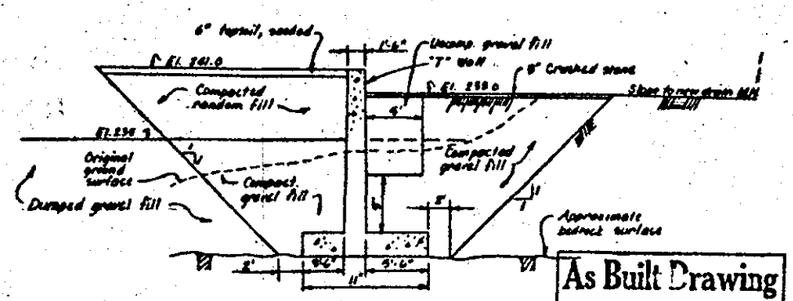


SECTION B-B - TOE IN EARTH
SCALE: 1" = 10'

Note: Set Alternate Toe Detail on bedrock. If applicable, use mirror image.



SECTION C-C
SCALE: 1" = 10'



SECTION D-D
SCALE: 1" = 5'

As Built Drawing
Contract No. DACW 33-82-C-0032

VALUE ENGINEERING PAYS DIVIDENDS

SAFETY PAYS

GRAPHIC SCALES
1" = 20' — 20' 0 20' 40'
1" = 10' — 10' 0 10' 20'
1" = 5' — 5' 0 5' 10'

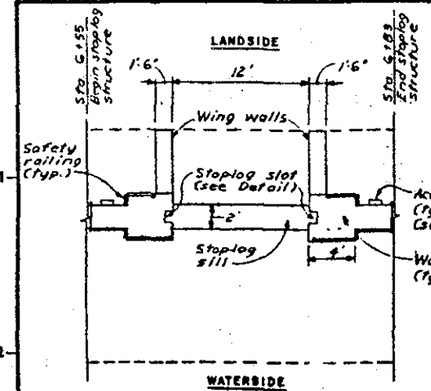
	12/3/84	Final Field corrections
	DATE	DESCRIPTION

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

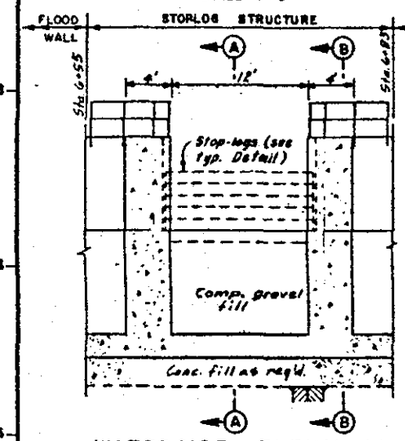
WATER RESOURCES DEVELOPMENT PROJECT
HARTLAND, MAINE
LOCAL PROTECTION PROJECT
DIKE "C" AND SLOPE PROTECTION
PLAN, PROFILE AND SECTIONS
SEBASTICOOK RIVER MAINE

APPROVED Jane B. Kaynor DATE JULY 1982
SCALE AS SHOWN SPEC. NO. DACW 33-82-B-0032
HAR-1
SHEET 14

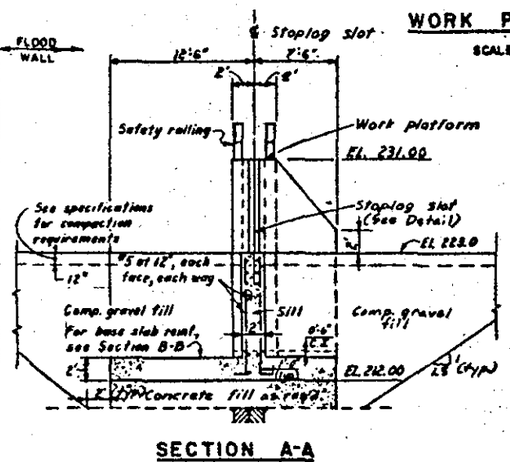
CORPS OF ENGINEERS — U. S. ARMY



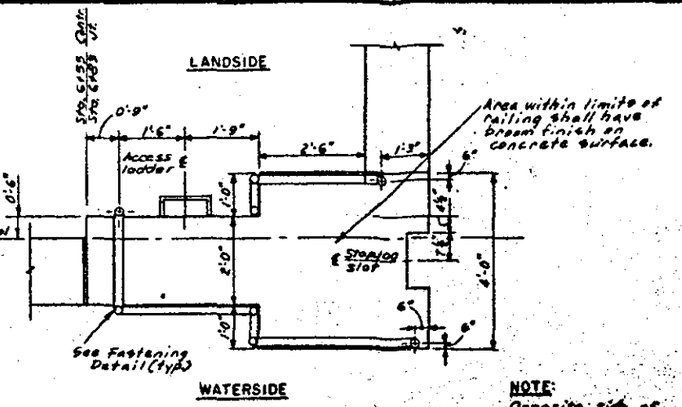
PLAN
SCALE: 1"=5'



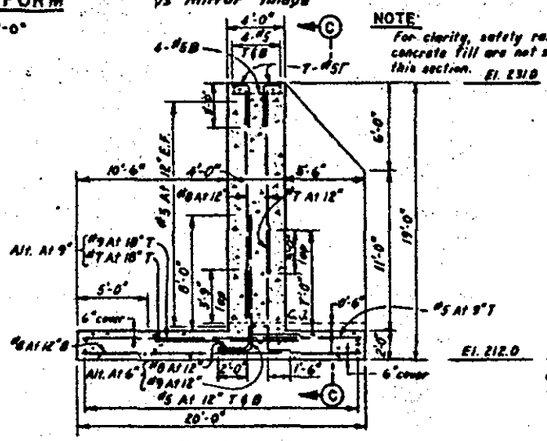
WATERSIDE ELEVATION STOPLOG STRUCTURE
SCALE: 1"=5'



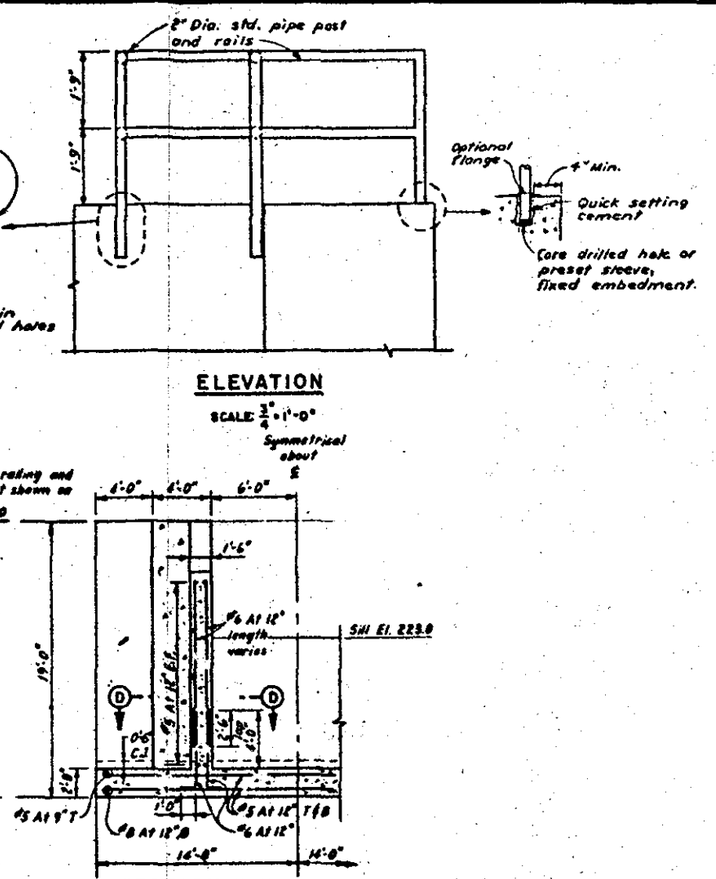
SECTION A-A
SCALE: 1"=5'



WORK PLATFORM
SCALE: 3/4"=1'-0"

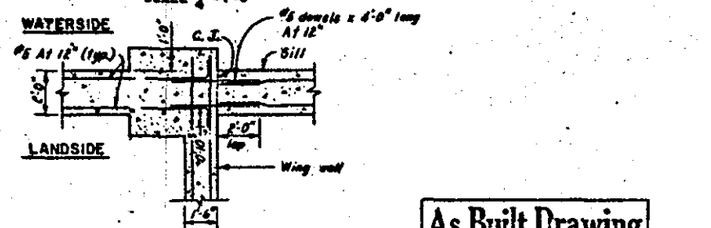


SECTION B-B
SCALE: 1/4"=1'-0"

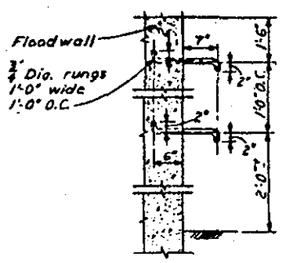


SECTION C-C
SCALE 1/4"=1'-0"

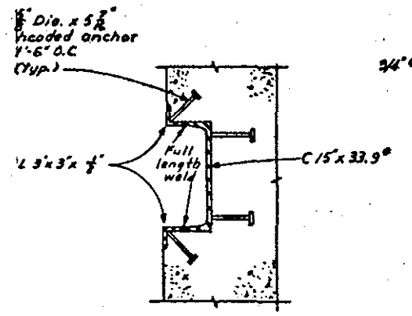
ELEVATION
SCALE: 3/4"=1'-0"
Symmetrical about ℄



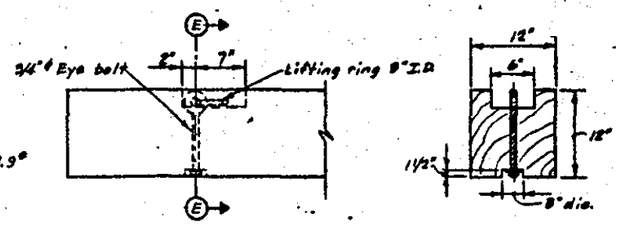
SECTION D-D
SCALE: 3/8"=1'-0"



LADDER RUNG DETAIL
SCALE: 1/2"=1'-0"

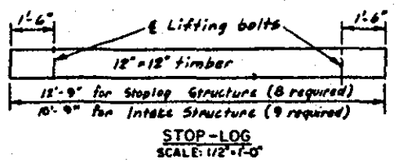


STOPLOG SLOT DETAIL
SCALE: 1/2"=1'-0"



LIFTING BOLTS
SCALE: 1 1/2"=1'-0"

SECTION E-E



STOP-LOG
SCALE: 1/2"=1'-0"

STOP-LOG DETAIL

VALUE ENGINEERING PAYS DIVIDENDS

SAFETY PAYS

GRAPHIC SCALES
1"=5'
1/2"=1'-0"
3/8"=1'-0"
3/4"=1'-0"
1/8"=1'-0"
1/4"=1'-0"

As Built Drawing
Contract No. DACW 33-82-C-0052

NO.	DATE	DESCRIPTION	BY
	7/13/84	Final field corrections	

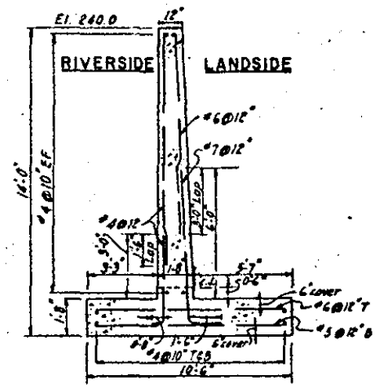
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

WATER RESOURCES DEVELOPMENT PROJECT
HARTLAND, MAINE
LOCAL PROTECTION PROJECT
STOP-LOG STRUCTURE
PLAN, ELEVATIONS, SECTIONS & DETAILS
SEBASTICOOK RIVER — MAINE

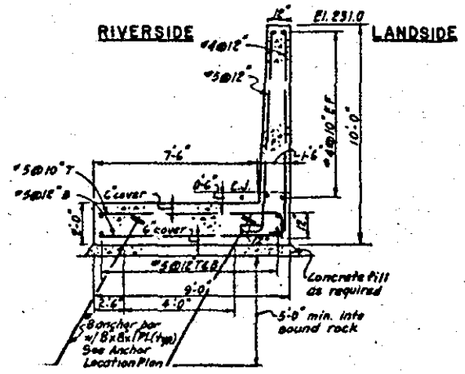
APPROVED: [signature] — CHIEF, ENGINEERING DIVISION — DATE: JULY 1982

SCALE AS SHOWN — SPEC. NO. DACW33-82-B-0052 — DRAWING NUMBER HAR-1 — SHEET 15

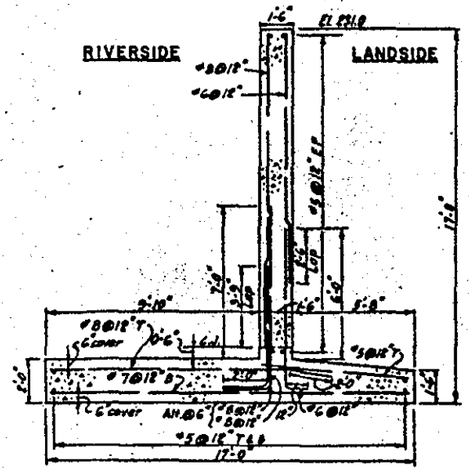
CORPS OF ENGINEERS — U. S. ARMY



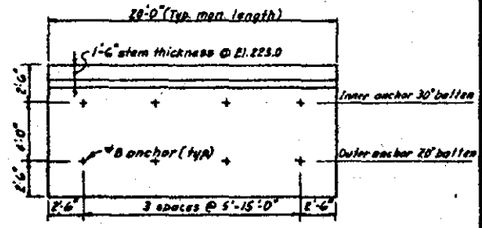
TYPE "A" WALL
SCALE: 3/8"=1'-0"



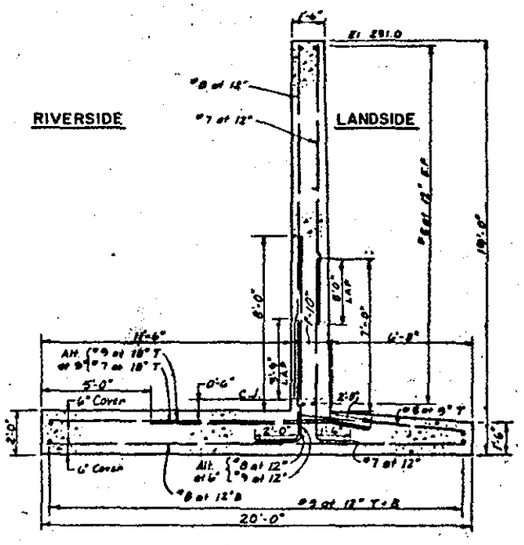
TYPE "B" WALL
SCALE: 3/8"=1'-0"



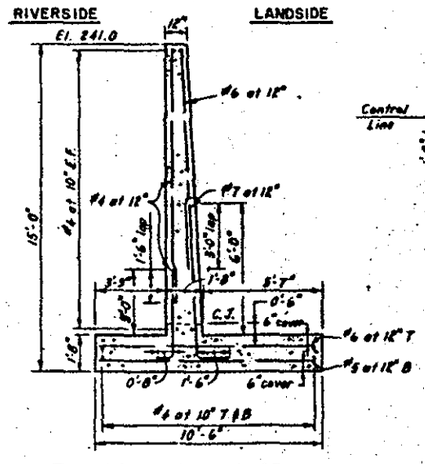
TYPE "C" WALL
SCALE: 3/8"=1'-0"



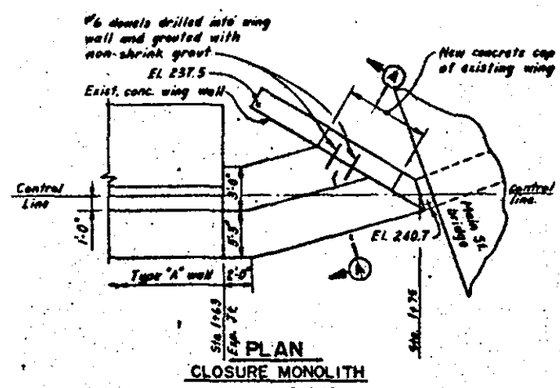
TYPE "B" WALL - Sta. 3+15 to Sta. 3+55
ANCHOR LOCATION PLAN
SCALE: 1/16"=1'-0"



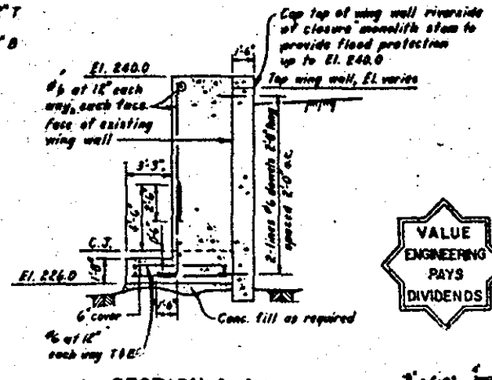
TYPE "D" WALL
SCALE: 3/8" = 1'-0"



TYPICAL WALL SECTION
STA. 0+00 TO 0+35
SCALE: 3/8"=1'-0"



PLAN
CLOSURE MONOLITH
SCALE: 1/4"=1'-0"



SECTION A-A
SCALE: 1/4"=1'-0"

VALUE ENGINEERING PAYS DIVIDENDS

SAFETY PAYS

GRAPHIC SCALES
1"=1'-0"
1/2"=1'-0"

NOTES:

1. Steel reinforcement shall conform to ASTM A615, Grade 60.
2. Minimum concrete cover over reinforcement shall be 4" unless otherwise noted.
3. Longitudinal reinforcement shall not run through vertical contraction or expansion joints. Reinforcement shall end 3" back from joint.
4. All walls have been designed for a 250#/S.F. surcharge loading on landside.

As Built Drawing
Contract No. DACW 33-82-C-0052

REVISION	DATE	DESCRIPTION	BY
	7/13/84	Final field corrections	

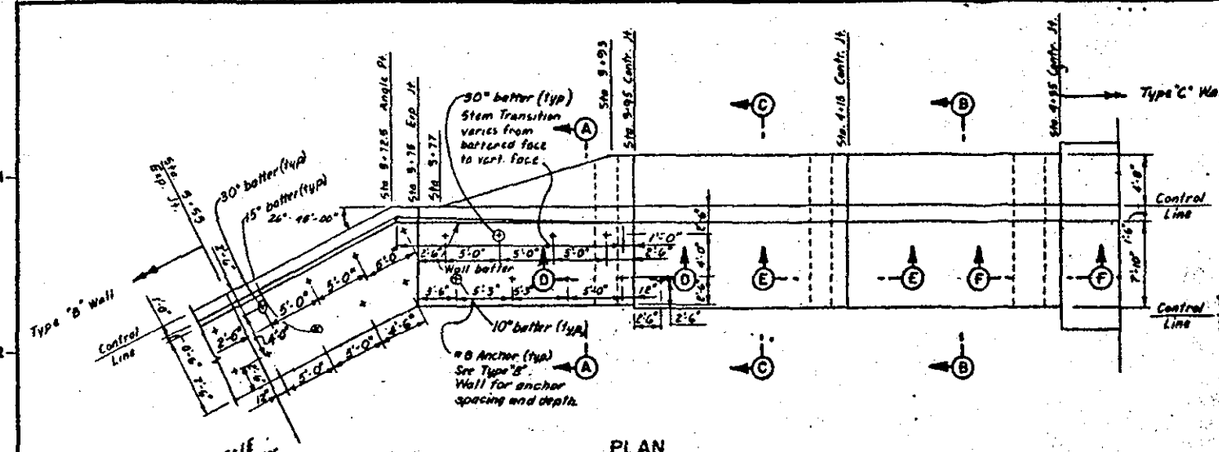
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

WATER RESOURCES DEVELOPMENT PROJECT
HARTLAND, MAINE
LOCAL PROTECTION PROJECT
TYPICAL FLOOD WALL SECTIONS
REINFORCEMENT DETAILS NO. 1
SEBASTICOOK RIVER MAINE

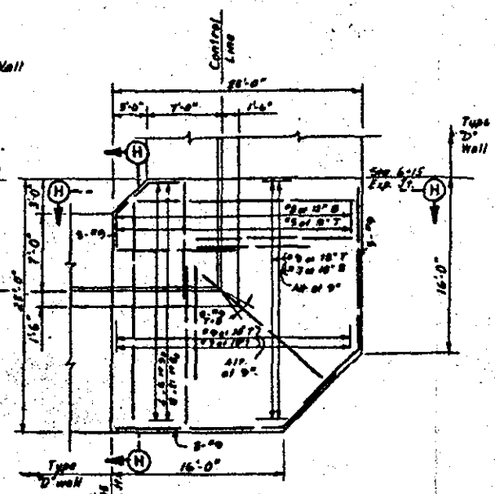
APPROVED [signature] CHIEF, ENGINEERING BRANCH
DATE JULY 1982

SCALE AS SHOWN | SPEC. NO. DACW33-82-B-0052
DRAWING NUMBER HAR-1
SHEET 16

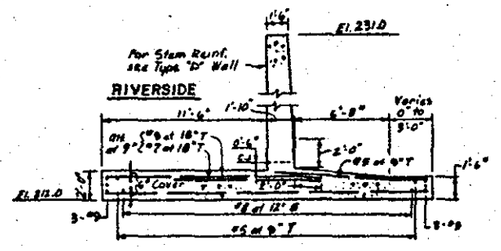
CORPS OF ENGINEERS — U. S. ARMY



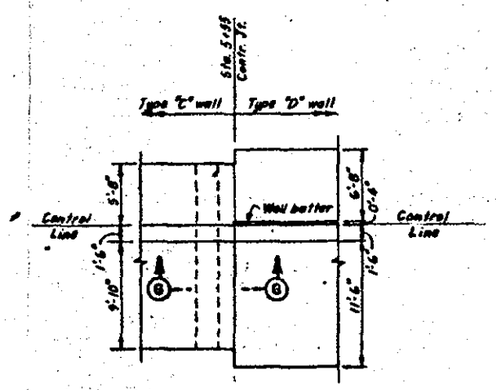
PLAN
STA. 3+55 TO STA. 4+35
SCALE: 3/16" = 1'-0"



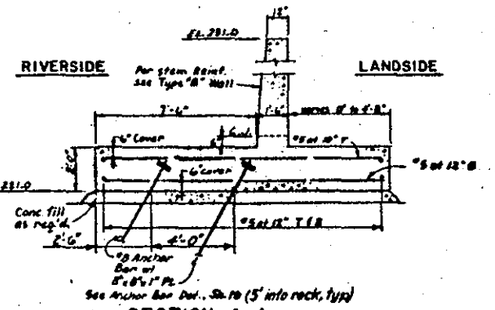
PLAN
CORNER MONOLITH STA. 6+05
SCALE: 3/16" = 1'-0"



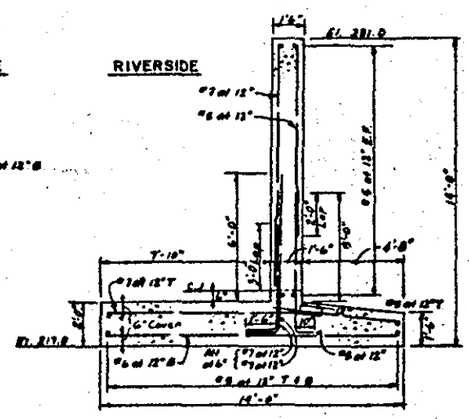
SECTION H-H
SCALE: 1/4"=1'-0"



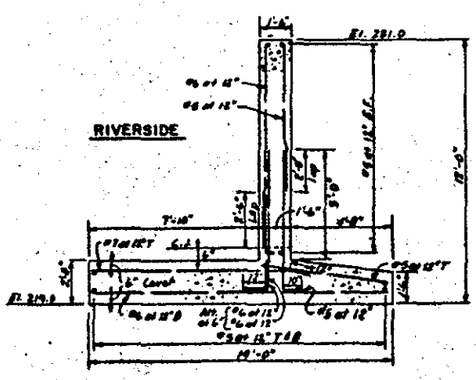
PLAN
STA. 5+55
SCALE: 3/16" = 1'-0"



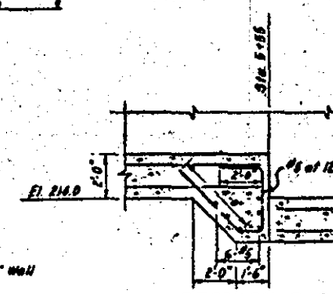
SECTION A-A
SCALE: 3/8"=1'-0"



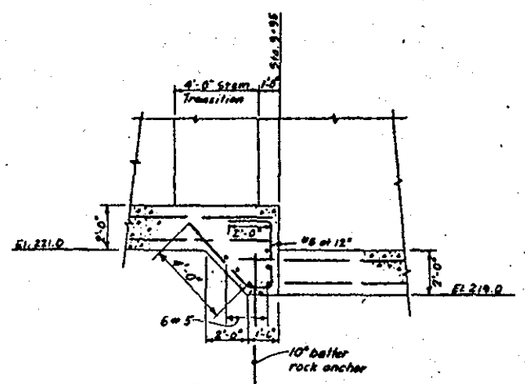
SECTION B-B
SCALE: 3/8"=1'-0"



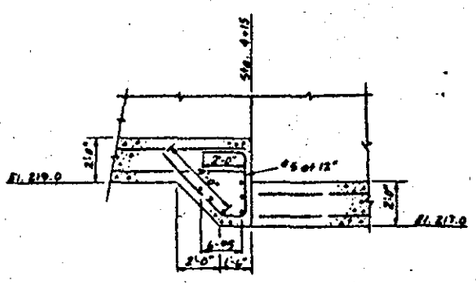
SECTION C-C
SCALE: 3/8"=1'-0"



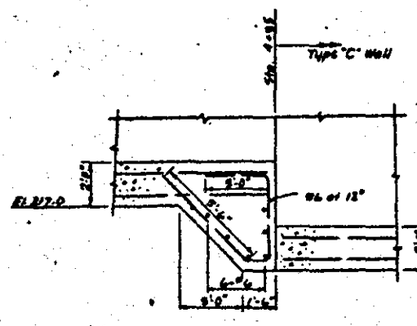
SECTION G-G
SCALE: 3/8"=1'-0"



SECTION D-D
SCALE: 3/8"=1'-0"



SECTION E-E
SCALE: 3/8"=1'-0"



SECTION F-F
SCALE: 3/8"=1'-0"

VALUE ENGINEERING PAYS DIVIDENDS

SAFETY PAYS

GRAPHIC SCALES
3/8"=1'-0"
3/16"=1'-0"

As Built Drawing
Contract No. DACW 33-82-C-0032

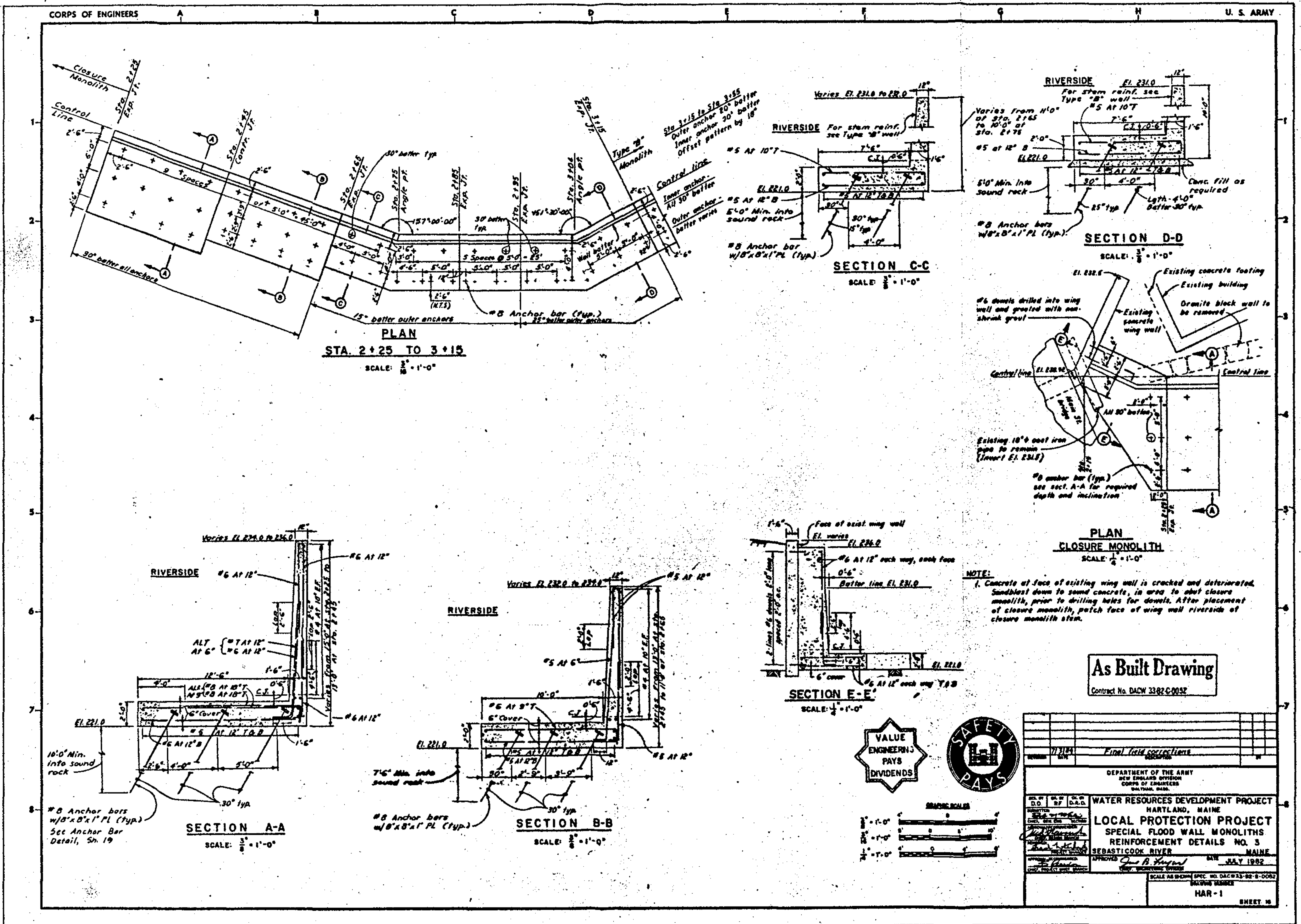
	7/1984	Final field corrections.
	DATE	DESCRIPTION

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

WATER RESOURCES DEVELOPMENT PROJECT
HARTLAND, MAINE
LOCAL PROTECTION PROJECT
SPECIAL FLOOD WALL MONOLITHS
REINFORCEMENT DETAILS NO. 2
SEBASTICOOK RIVER — MAINE

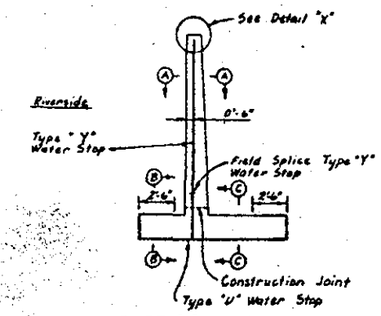
APPROVED: Jon B. Fuqua — DATE: JULY 1982

SCALE AS SHOWN | SPEC. NO. DACW33-82-B-0032
DRAWING NUMBER: HAR-1
SHEET 17

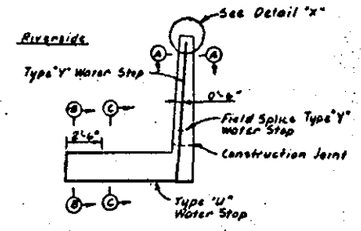


CORPS OF ENGINEERS
U. S. ARMY
PLAN
STA. 2+25 TO 3+15
SCALE: 3/8" = 1'-0"
SECTION C-C
SCALE: 3/8" = 1'-0"
SECTION D-D
SCALE: 3/8" = 1'-0"
RIVERSIDE
PLAN
CLOSURE MONOLITH
SCALE: 1/4" = 1'-0"
NOTE:
1. Concrete at face of existing wing wall is cracked and deteriorated. Sandblast down to sound concrete, in area to abut closure monolith, prior to drilling holes for dowels. After placement of closure monolith, patch face of wing wall riverside of closure monolith stem.
As Built Drawing
Contract No. DACW 33-82-C-0052
SECTION A-A
SCALE: 3/8" = 1'-0"
SECTION B-B
SCALE: 3/8" = 1'-0"
SECTION E-E
SCALE: 1/4" = 1'-0"
VALUE ENGINEERING PAYS DIVIDENDS
SAFETY PAYS
Final field corrections
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.
WATER RESOURCES DEVELOPMENT PROJECT
HARTLAND, MAINE
LOCAL PROTECTION PROJECT
SPECIAL FLOOD WALL MONOLITHS
REINFORCEMENT DETAILS NO. 3
SEBASTICOOK RIVER
MAINE
JULY 1982
HAR-1

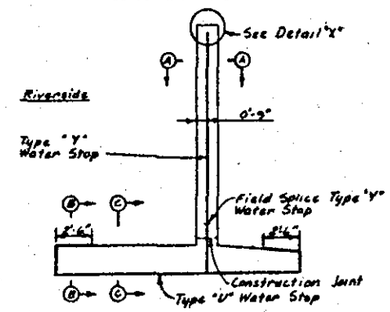
CORPS OF ENGINEERS — U. S. ARMY



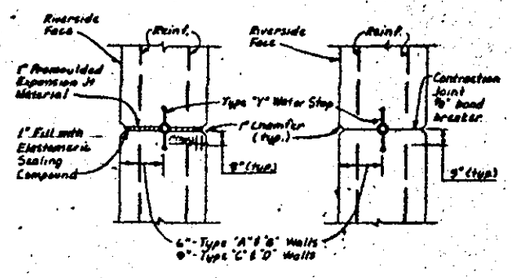
TYPE "A" WALL
WATER STOP DETAILS
SCALE: 1/4" = 1'-0"



TYPE "B" WALL
WATER STOP DETAILS
SCALE: 1/4" = 1'-0"

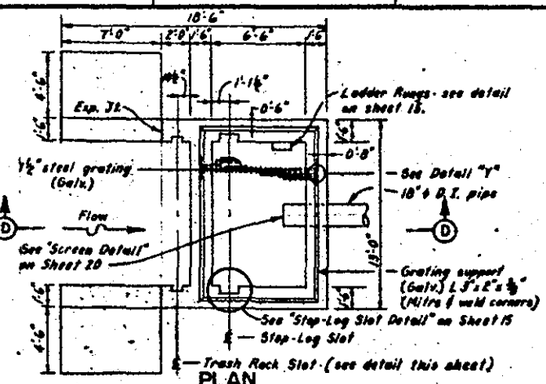


TYPE "C" & "D" WALLS
WATER STOP DETAILS
SCALE: 1/4" = 1'-0"

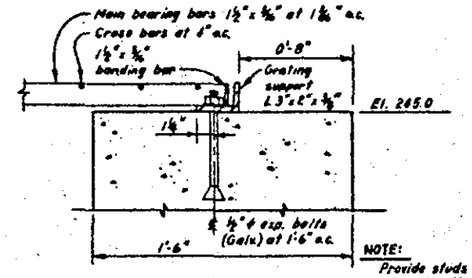


TYPICAL STEM
EXPANSION JOINT

TYPICAL STEM
CONTRACTION JOINT

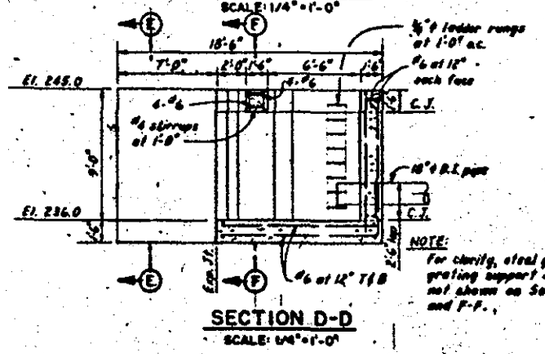


PLAN
INTAKE STRUCTURE
SCALE: 1/4" = 1'-0"

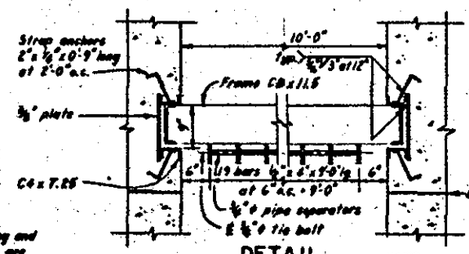


DETAIL "Y"
SCALE: 3" = 1'-0"

NOTE:
Provide studs and saddle clips (Galv.) to fasten grating to support.

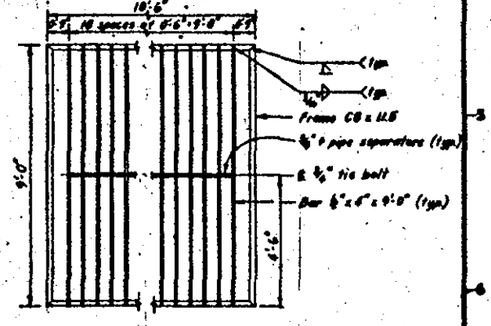


SECTION D-D
SCALE: 1/4" = 1'-0"

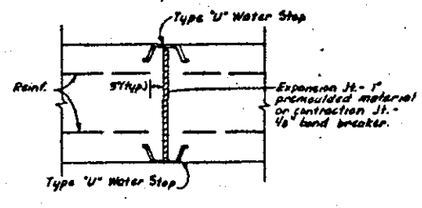


DETAIL
TRASH RACK AND SLOT
SCALE: 1" = 1'-0"

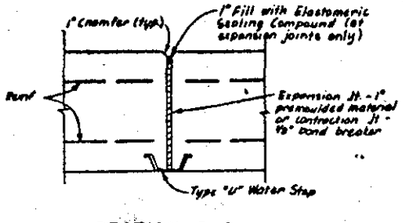
NOTE:
Trash rack and all embedded steel shapes shall be galvanized.



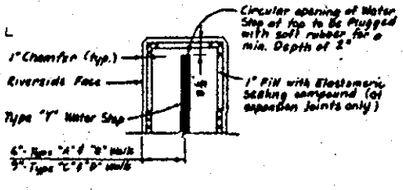
ELEVATION
TRASH RACK
SCALE: 1/8" = 1'-0"



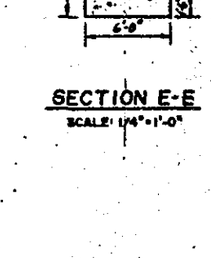
SECTION B-B
SCALE: 1" = 1'-0"



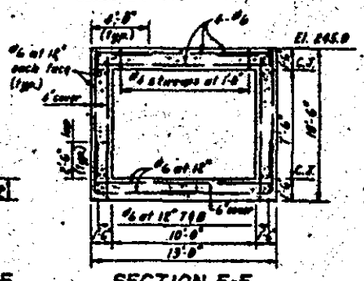
SECTION C-C
SCALE: 1" = 1'-0"



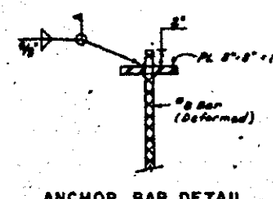
DETAIL "X"
SCALE: 1" = 1'-0"



SECTION E-E
SCALE: 1/4" = 1'-0"



SECTION F-F
SCALE: 1/4" = 1'-0"



ANCHOR BAR DETAIL
SCALE: 1-1/2" = 1'-0"

VALUE ENGINEERING PAYS DIVIDENDS

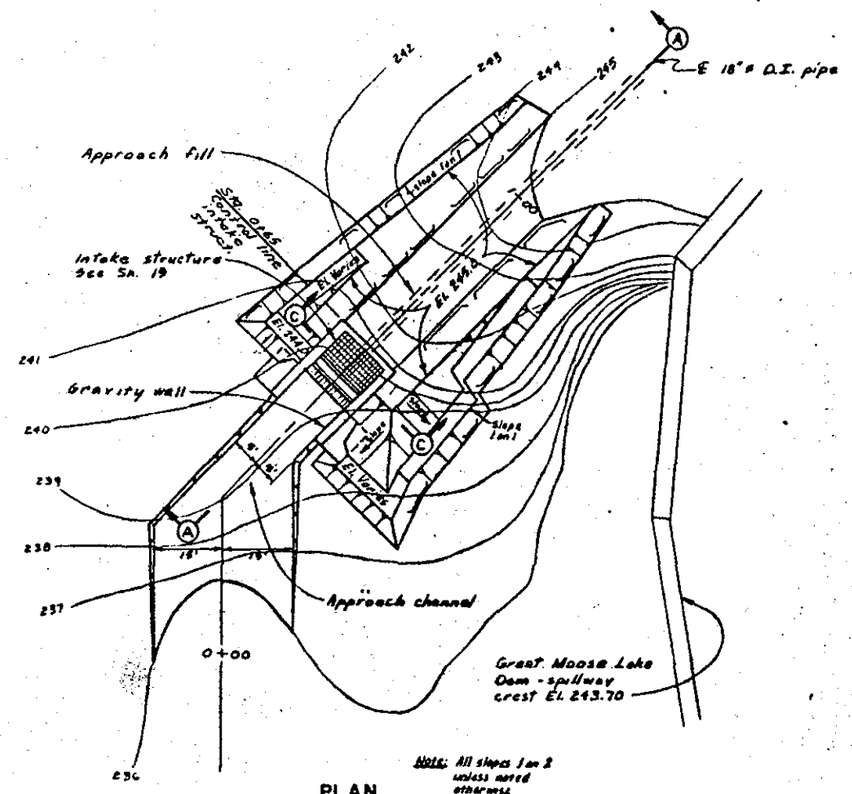
SAFETY PAYS

DRAFTING SCALES
1-1/2"=1'-0"
1/4" = 1'-0"
1" = 1'-0"
3/8" = 1'-0"
1/8" = 1'-0"

As Built Drawing
Contract No. DACW 33-82-C-0032

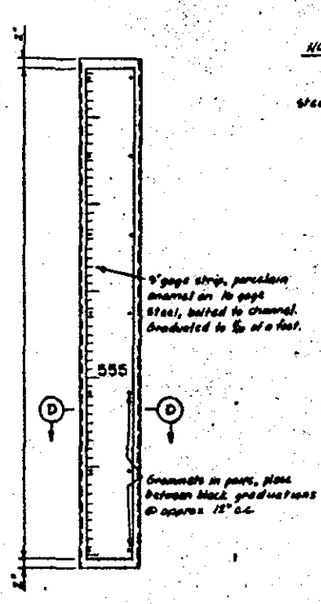
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WATER RESOURCES DEVELOPMENT PROJECT
HARTLAND, MAINE
LOCAL PROTECTION PROJECT
STRUCTURAL
MISCELLANEOUS DETAILS
SEBASTICOOK RIVER MAINE
APPROVED Jan B. Ford
DATE JULY 1982
SCALE AS SHOWN
SPEC. NO. DACW33-82-B-0032
DRAWING NUMBER
HAR-1
SHEET 19

CORPS OF ENGINEERS — U. S. ARMY



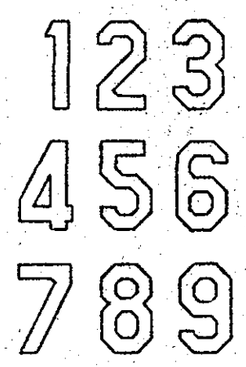
PLAN
SCALE: 1"=10'

Note: All slopes 1 on 2 unless noted otherwise



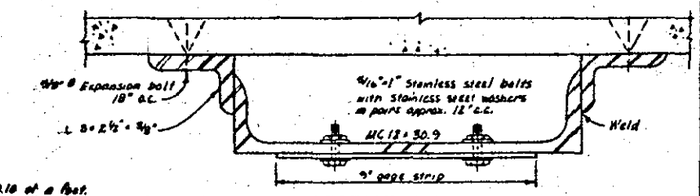
TYPICAL STAFF GAGE
N.T.S.

NOTES
1. Staff gage graduations are in 0.10 of a foot.
2. Porcelain enamel on 16 gage steel. Fasten to steel channel with 3/16"ø stainless steel bolts.
3. For location see sheet 4.

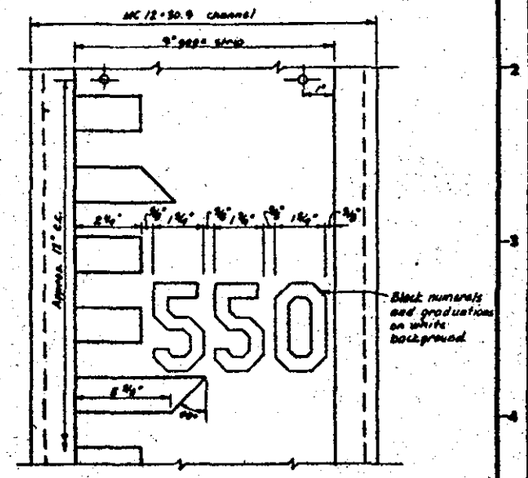


TYPICAL STAFF GAGE NUMERALS
SCALE: 6" = 1'-0"

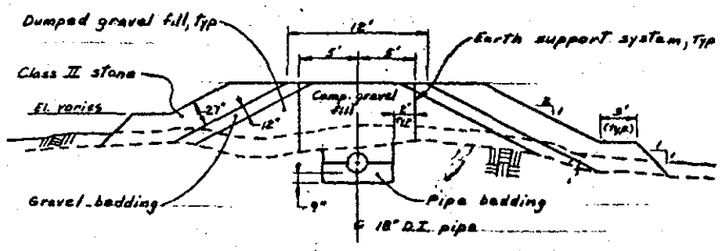
PORCELAIN ENAMEL STAFF GAGE



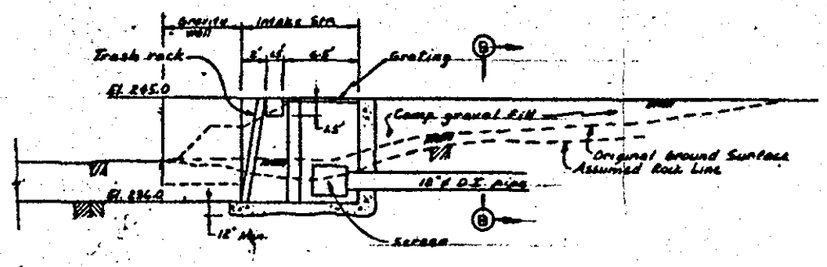
SECTION D-D
HALF SIZE



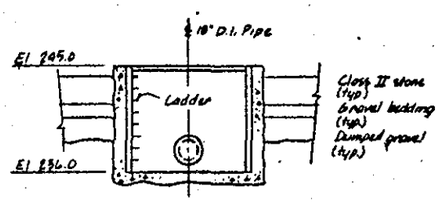
THREE NUMBER GAGE
HALF SIZE



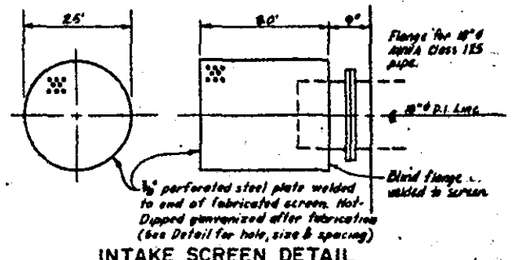
SECTION B-B
SCALE: 1"=5'



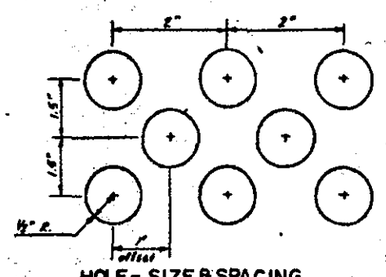
SECTION A-A
SCALE 1"=5'



SECTION C-C
SCALE: 1"=5'



INTAKE SCREEN DETAIL
SCALE: 3/4"=1'-0"



HOLE - SIZE & SPACING DETAIL
N.T.S.

VALUE ENGINEERING PAYS DIVIDENDS

SAFETY PAYS

GRAPHIC SCALES
1"=10' 0 10' 20'
1"=5' 0 5' 10'
3/4"=1'-0" 0 1' 2'

As Built Drawing
Contract No. DACW 33-82-C-0052

	7/13/84	Final field corrections	
REVISION	DATE	DESCRIPTION	BY

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CH. BY
J.L.	J.L.	J.L.

WATER RESOURCES DEVELOPMENT PROJECT
HARTLAND, MAINE
LOCAL PROTECTION PROJECT
INTAKE STRUCTURE & STAFF GAGE
PLAN, STRUCTURES & DETAILS
SEBASTICOOK RIVER MAINE

APPROVED Jan A Lyon DATE JULY 1982
CHIEF, ENGINEERING DIVISION

SCALE AS SHOWN SPEC. NO. DACW 33-82-C-0052
DRAWING NUMBER
NAR-1
SHEET 20